UK MET OFFICE
GLOBAL DATA MONITORING REPORT

May 2004

Data Assimilation
Meteorological Office
Fitzroy Rd
Exeter
Devon
EX1 3PB

This report has not been published. Permission to quote from it should be obtained from the Head of Data Assimilation

Distribution List

Mr B Sumner	NMC, Victoria, Australia
Dr S. C. Chou	CPTEC/INPE, Brazil
Dr V Wagner	Deutscher Wetterdienst, Hamburg, Germany
Dr B Ballish	NCEP, Camp Springs, USA
Mr H Benichou	SCEM METEO-FRANCE.
Mr E A Meindl	National Data Buoy Centre, Stennis Space Center, USA
Mr G Verner	Canadian Meteorological Centre, Quebec, Canada
Dr R Pauley	Fleet NumericalMETOC Center, Moneterey
Permanent Rep. with WMO	Moscow, Russia
Hydrometcentre of the Russian Federation	Moscow, Russia
Mr Yukinari Ohta	JMA, Tokyo, Japan
Mr Francois Lalaurette	Head, Meteorological Operations Section, ECMWF, Reading, UK
Dr M J Uddstrom	Met. Service, Wellington, New Zealand
Mr R W Lunnon	Met. Office, Exeter, UK
Mr D Richardson	Met. Office, Exeter, UK
Mr B Oatway	Met. Office, Exeter, UK
Mr C A Parrett	Met. Office, Exeter, UK
National Meteorological Library	Met. Office, Exeter, UK

CONTENTS

1. Introduction

2. Global Data Monitoring Statistics

3. Composite Observing Systems for the North Atlantic (COSNA)

...oooOOOooo...

1. Introduction

As the WMO-appointed lead centre for monitoring surface marine data, the U.K. Meteorological Office produces monthly statistics on the quality of these observations received at RSMC Exeter. This report includes this information along with statistics for most other types of data. The figures and tables contained herein are presented according to the agreed standards for the exchange of monitoring results.

The report is based on data received at the UK Meteorological Office Headquarters, Exeter in time for inclusion into the appropriate analysis (the current cut-off time is approximately 7.2 hours after each analysis time). The evaluation of data quality is based on comparison with the appropriate 6-hour global model forecast (background) field, although to provide background values valid at the observation time for non-main hour data, time-interpolation of the T+3, T+6 and T+9 forecasts is used; and for sea surface temperature the background field is the analysis from the previous day. Generally, the background field is of high quality except in data sparse areas, tropical regions and areas close to steep orography where care should be taken in interpreting the statistics shown.

Comments or queries on the report are welcome and should be addressed to:-

Mr. D. Richardson
Observations Data Monitoring Group
Met Office
Fitzroy Road
Exeter
Devon
United Kingdom
EX1 3PB

2 Global Data Monitoring Statistics

Ships, Fixed buoys, Platforms and Drifting buoys observations

TABLES 1and 2 contain lists of the stations which are considered to have returned suspect observations of pressure, windspeed, wind direction or sea surface temperature, as appropriate, during the month. The criteria for quality control are given on the header page for each table.

Figures 1 and 2 show 10 degree lat/long box average numbers of SHIP/SYNOP and DRIFTER observations received per day throughout the month at Exeter and assimilated into model runs. All data are included. Box average values are plotted as the nearest whole number (values of x.5 are rounded up). Where the average is more than 999, then 999 is plotted. A box with no observations is blank. If the 24 hour average >0 but <0.5, then 0 is plotted.

Synop Observations

Table 3 contains a list of stations which are considered to have returned suspect observations of Pressure during the month. The criteria for quality control are given in the header page. The reporting practice of each station is included in the list of statistics.

At the UK Met. Office, we monitor SYNOP pressure after it has been interpolated to our Global NWP Model's surface height. For most synoptic stations (about 75%), the surface pressure (at the model surface) is calculated from the reported station-level pressure, or, if this is not available, the height of a standard pressure-level (e.g. 850 hPa or 700 hPa). If neither of these are available, or if the reported station-level pressure is deemed unreliable, the reported mean sea-level pressure is used (about 25% of SYNOPs).

Aircraft observations

Tables 4A (300-150 hPa) and 4B (1000-301 hPa) contain lists of statistics calculated from data received from all airline carriers.

Figures 3A (300-150 hPa) and 3B (1000-301 hPa) show 10 degree lat/long box average numbers of aircraft reports in AIREP/AMDAR code (including AIREP, ACAR, AMDAR, ASDAR and ADS) received per day throughout the month at Exeter and assimilated into model runs. Observations with a vector wind difference (compared with the model background field) of >60 m s^{-1} have been excluded. Box average values are plotted as the nearest whole number (values of x.5 are rounded up). Where the average is more than 999, then 999 is plotted. A box with no observations is blank. If the 24 hour average >0 but <0.5, then 0 is plotted.

Figures 4A-7A (300-150 hPa) and 4B-7B (1000-301 hPa) show wind statistics for AIREP/ASDAR in AIREP/AMDAR code (including AIREP, ACAR, AMDAR, ASDAR and ADS). Observations with a vector wind difference > 60 m s^{-1} have been excluded. Statistics have not been calculated for 10 degree lat/long boxes containing <31 observations.

Figure	Parameter
4	Mean wind vectors
5	Mean observation - background wind vector
6	Mean observation-background speed (m s^{-1})
7	RMS observation-background vector (m s^{-1})

Radiosonde Observations

TABLES 5-7 contain lists of the stations which are considered to have returned suspect observations of geopotential height, vector wind or wind direction, as appropriate, during the month. The criteria for quality control are given on the header page for each table.

Figures 8 and 9 show 10 degree lat/long box average numbers of TEMP 500 hPa GEOPOTENTIAL HEIGHT and TEMP/PILOT 300 hPa WIND observations received per day throughout the month at Exeter and assimilated into model runs. Data from all hours are included. Box average values are plotted as the nearest whole number (values of x.5 are rounded up). Where the average is more than 999, then 999 is plotted. A box with no observations is blank. If the 24 hour average >0 but <0.5, then 0 is plotted.

APPENDIX I shows details of the gross error limits used in TABLES 5 and 6 and the weights used in the RMS values in TABLE 5.

Satellite Observations

Figures 10-24 show satellite wind statistics for all geostationary satellites. All plots other than **AVAILABILITY** show average data where there are > 10 observations in a 10 degree lat/long box.

Figure	Parameter Plotted	Layer (hPa)
10	Availability/average daily number	701-1000
11	Vector mean wind (observed)	701-1000
12	Observation-background vector wind difference	701-1000
13	Mean observation-background speed differences	701-1000
14	RMS observation-background vector difference	701-1000
15	Availability/average daily number	401-700
16	Vector mean wind (observed)	401-700
17	Observation-background vector wind difference	401-700
18	Mean observation-background speed differences	401-700
19	RMS observation-background vector difference	401-700
20	Availability/average daily number	101-400
21	Vector mean wind (observed)	101-400
22	Observation-background vector wind difference	101-400
23	Mean observation-background speed differences	101-400
24	RMS observation-background vector difference	101-400

Figures 25-39 show sounding statistics from the polar orbitting satellite NOAA-15. Figure 25 shows the mean daily number of ATOVS soundings, and figures 26-39 show mean and standard deviation observation-background differences for brightness temperature, for selected channels.

Figure		Weighting function peak (hPa)
26	Mean	Surface (HIRS8)
27	SD	Surface (HIRS8)
28	Mean	700 (HIRS15)
29	SD	700 (HIRS15)
30	Mean	500-700 (HIRS11)
31	SD	500-700 (HIRS11)
32	Mean	400 (HIRS4)
33	SD	400 (HIRS4)
34	Mean	700 (AMSUA5)
35	SD	700 (AMSUA5)
36	Mean	300 (AMSUA7)
37	SD	300 (AMSUA7)
38	Mean	100 (AMSUA9)
39	RMS	100 (AMSUA9)

Figures 40-54 show sounding statistics from the polar orbitting satellite NOAA-16. Figure 40 shows the mean daily number of ATOVS soundings, and figures 41-54 show mean and standard deviation observation-background differences for brightness temperature, for selected channels.

Figure		Weighting function peak (hPa)
41	Mean	Surface (HIRS8)
42	SD	Surface (HIRS8)
43	Mean	700 (HIRS15)
44	SD	700 (HIRS15)
45	Mean	500-700 (HIRS11)
46	SD	500-700 (HIRS11)
47	Mean	400 (HIRS4)
48	SD	400 (HIRS4)
49	Mean	700 (AMSUA5)
50	SD	700 (AMSUA5)
51	Mean	300 (AMSUA7)
52	SD	300 (AMSUA7)
53	Mean	100 (AMSUA9)
54	RMS	100 (AMSUA9)

Figures 55-69 show sounding statistics from the polar orbitting satellite NOAA-17. Figure 55 shows the mean daily number of ATOVS soundings, and figures 56-69 show mean and standard deviation observation-background differences for brightness temperature for selected channels.

Figure		Weighting function peak (hPa)
56	Mean	Surface (HIRS8)
57	SD	Surface (HIRS8)
58	Mean	700 (HIRS15)
59	SD	700 (HIRS15)
60	Mean	500-700 (HIRS11)
61	SD	500-700 (HIRS11)
62	Mean	400 (HIRS4)
63	SD	400 (HIRS4)
64	Mean	700 (AMSUA5)
65	SD	700 (AMSUA5)
66	Mean	300 (AMSUA7)
67	SD	300 (AMSUA7)
68	Mean	100 (AMSUA9)
69	RMS	100 (AMSUA9)

N.B. All satellite sounding data is bias-corrected (and thinned) before being assimilated in the UKMO NWP model.

3 Composite Observing Systems for the North Atlantic (COSNA)

This section shows statistics for upper air (radiosonde and aircraft) and surface (drifter) data for the North Atlantic area for data received at Exeter during the month.

TABLE 8 shows quality statistics for **Mean Sea-level Pressure, Windspeed and Wind Direction** received at Exeter in DRIFTER code during the month for the area 10°N - 80°N, 85°W - 0°W.

TABLE 9 shows quality statistics for **Temperature and Vector Wind** received at Exeter from aircraft during the month for the area 40°N - 70°N, 60°W - 0°W.

Table 10 - 13 show quality statistics **(Geopotential Height and Windspeed at 100 and 500 hPa)** for all TEMPSHIPS in the area bounded by 0°N - 90°N, 100°W - 40°E and selected TEMP stations within the same area.

Revisions

1. May 95 Monitoring statistics for NOAA-11 removed. Figures 25-27 now show data for NOAA-12
2. May 95 Notes giving details of observations included in wind direction statistics clarified and corrected.
3. August 95 Monitoring statistics for NOAA-14 added with figures 28-30.
4. February 96 Monitoring statistics for GOES-7 have been replaced by statistics for GOES-8 and GOES-9.
5. April 96. 500 km and 120 km SATEMs replaced by 120 km resolution temperature profiles produced locally from the radiances disseminated by NESDIS.
6. February 97 Monitoring statistics for Meteosat 5 have been replaced by statistics for Meteosat 6.
7. Sept 97 Monitoring statistics for NOAA-12 removed. Figures 25-27 now show data for NOAA-11
8. January 1998. Increase in resolution of UKMO global forecast model.
9. April 1998. GOES winds ceased on 2nd March 1998, and were replaced with GOES high resolution winds from 15th.
10. June 1998. Monitoring statistics for Meteosat-6 were replaced by monitoring statistics for Meteosat-7, from 3rd June.
11. June 1998. Corrections in our processing of radiosonde data resulted in a decrease in the number of 500hPa geopotential heights in Figure 8 of about 230 per 24 hours (compared with previous reports), and a small increase in the number of 300hPa winds in Figure 9.
12. July 1998. Meteosat-5 began transmitting winds from 2nd July, at 63 degrees East (over the Indian ocean), and this data is included in the statistics.
13. July 1998. GOES-9 (at 135W) was replaced mid-month by GOES-10 (initially at 105W, moving towards 135W).
14. February 1999. Problems with NOAA-11, and TOVS data ceased to be assimilated from 26 February.
15. March 1999. UKMO introduced 3-D VAR assimilation system on 29 March, and also began assimilating ATOVS data from NOAA-15.
16. May 1999. Included statistics for ATOVS sounding data from NOAA-15.
17. September 1999. Included statistics for high resolution visible winds from Meteosat-5 and Meteosat-7.
18. October 1999. The 3-D VAR assimilation system was upgraded on 19 October, including improvements in the assimilation of ATOVS radiances, use of SSM/I surface wind speed, an improvement in the calculation of surface pressure for SYNOPs, and thinning and revision of observation errors of aircraft data.
19. November 1999. High resolution visible winds from Meteosat-5 and Meteosat-7 removed until used operationally.
20. April 2000. Aireps in Table 4 and Figures 3-7 split into ranges 300-150 hPa (A) and 1000-301 hPa (B).
21. September 2000. Corrected an error affecting the mean positions of a minority of buoys in Table 2.
22. November 2000. An error in the production of Table 6 was corrected. Previously, some sondes with suspect vector winds were being missed.
23. April 2001. Included statistics for ATOVS sounding data from NOAA-16.
24. May 2001. Included statistics for sea surface temperatures from marine surface observations.
25. December 2002. Included statistics for ATOVS sounding data from NOAA-17.
26. December 2002. Meteosat-7 and Meteosat-5 SATOB winds replaced by higher resolution BUFR-coded winds.
27. November 2003. Included temperature and relative humidity statistics for ships, fixed buoys and platforms in Table 1.
28. November 2003. NOAA 17 statistics no longer available due to malfunction of the AMSU-A instrument.

TABLE 1

MONITORING OF MARINE SURFACE OBSERVATIONS
MONTHLY SUSPECT LIST - SHIPS, FIXED BUOYS AND PLATFORMS
MONITORING CENTRE: EXETER
MONTH: May 2004

Monitoring procedures

Period	:One calendar month.
Data monitored	:Reports from each unique identifier for ships, fixed buoys and platforms.
Standard of comparison	:Background field from UKMO global model.
Observation times	:All hours
Elements monitored	:Mean sea level pressure (hPa). :Wind speed (m s^{-1}). :Wind direction (Degrees). :Air temperature (Degrees C). :Relative Humidity (%). :Sea surface temperature (Degrees).

Parameters monitored	:NOBS	:Number of observations received excluding duplicates.
	:PGE	:Percentage of observations with gross errors.
	:%REJ	:Percentage of observations flagged excluding those with gross errors.
	:SD	:SD of difference of observations from background values excluding those with gross errors.
	:BIAS	:Mean difference of observations from background values excluding those with gross errors. **N.B. a positive bias indicates the wind observation is veered to the background.**
	:RMS	:Root Mean Square difference of observations from background values excluding those with gross errors.

GROSS ERROR LIMIT	:15 hPa (pressure) :25 m s^{-1} (vector wind) :15 degrees (air temperature) :10 degrees (sea surface temperature)

SELECTION CRITERIA	:NOBS	≥ 20 , and one or more of the following:	
	1.|bias|	≥ 4 hPa	(pressure),
		≥ 5 m s^{-1}	(wind speed),
		≥ 30 degrees	(direction).
		≥ 3 degrees	(sea surface temperature).
		≥ 4 degrees	(air temperature)
		≥ 15%	(relative humidity)
	2.SD	≥ 6 hPa	(pressure),
		≥ 80 degrees	(direction).
		≥ 5 degrees	(sea surface temperature).
		≥ 6 degrees	(air temperature)
		≥ 25%	(relative humidity)
	3.PGE	≥ 25	

N.B. Observations of wind direction are only included in the wind direction statistics if the observed OR background wind speed > 5 m s^{-1}

IDENTIFIER	ELEM	NOBS	PGE	%REJ	SD	BIAS	RMS
AUBK	P	23	0	87	2.6	4.4	5.1
AVOSTEST	P	255	79	100	1.7	-8.6	8.8
A8CN8	P	38	0	50	0.8	5.1	5.2
A8DQ9	P	55	0	89	1.6	5.4	5.6
CGDS	P	32	0	100	0.8	-7.7	7.8
CG2522	P	182	83	100	0.5	-14.1	14.1
CG2992	P	103	100	100			
C6FV3	P	30	0	60	1.3	5.0	5.2
C6QK	P	44	0	57	1.5	4.8	5.0
C6TC2	P	32	0	78	0.7	4.7	4.8
DQVM	P	22	0	64	0.6	4.3	4.4
ELVY8	P	22	0	82	1.6	-6.2	6.4
ELZN3	P	62	3	82	1.8	6.3	6.5
KS003	P	167	0	76	0.5	5.0	5.0
KS005	P	103	0	0	0.4	-4.2	4.2
KS006	P	223	0	0	0.4	5.3	5.3
PHAA	P	20	0	90	3.0	4.1	5.1
UANF	P	28	0	86	1.2	4.3	4.5
UCCH	P	20	0	0	0.7	4.3	4.3
UCJL	P	33	0	100	4.6	5.9	7.5
VRYO2	P	40	0	2	1.5	4.8	5.0
WDCJ	P	27	0	4	0.9	4.0	4.1
WDJK	P	27	0	0	0.9	-4.2	4.3
WSRH	P	43	0	2	1.4	-4.0	4.3
WZ3423	P	22	9	45	6.7	1.7	6.9
4XIS	P	24	0	92	3.5	10.5	11.1

IDENTIFIER	ELEM	NOBS	PGE	%REJ	SD	BIAS	RMS
ELTY4	SPEED	30	0	100	6.0	11.6	13.0
OUEV	SPEED	60	0	23	4.4	5.5	7.0
SCKM	SPEED	33	0	100	3.6	6.5	7.4
UCMQ	SPEED	23	39	39	3.5	-0.4	3.5
VQHO7	SPEED	61	2	28	6.1	6.9	9.1
VRWG6	SPEED	37	0	65	4.2	5.0	6.5
VRYS8	SPEED	28	0	100	4.6	6.7	8.1
3FZM6	SPEED	27	11	100	3.4	7.5	8.2
44138	SPEED	415	0	1	2.8	-6.4	6.9

IDENTIFIER	ELEM	NOBS	PGE	%REJ	SD	BIAS	RMS
AVOSTEST	DIRN.	43	0	0	16.1	*****	134.9
ELPP9	DIRN.	21	0	0	68.7	33.2	76.3
FNCI	DIRN.	33	0	0	47.3	30.9	56.5
23097	DIRN.	38	0	0	24.6	-32.4	40.7
23172	DIRN.	21	10	0	123.4	86.1	150.5
3FZM6	DIRN.	20	15	0	98.2	-74.4	123.2

IDENTIFIER	ELEM	NOBS	PGE	%REJ	SD	BIAS	RMS
CGDT	T	527	0	100	3.1	-5.4	6.3
DEOT	T	79	0	100	1.5	5.0	5.2
D5XH	T	24	0	100	2.9	5.3	6.1
KS025	T	42	0	100	5.0	5.1	7.2
OWME	T	66	0	100	2.6	4.1	4.8
V7BX4	T	59	29	100	1.5	0.9	1.8
WCW9126	T	111	3	100	3.2	7.3	7.9
WI9491	T	25	0	100	3.5	8.5	9.1
WWU8	T	26	4	100	2.0	9.3	9.5
45149	T	501	0	100	3.6	-6.0	7.0
46081	T	712	0	100	2.3	6.7	7.1

IDENTIFIER	ELEM	NOBS	PGE	%REJ	SD	BIAS	RMS
AVOSTEST	RH	255	0	100	17.2	-15.6	23.2
CGDX	RH	133	0	100	16.6	-19.8	25.9

CG2522	RH	182	0	100	14.8	-16.5	22.2
CG2992	RH	103	0	100	10.7	-18.6	21.5
DFPC	RH	203	0	100	12.8	20.2	23.9
DGKV	RH	20	0	100	23.0	-18.3	29.4
ELZY4	RH	22	0	100	11.0	-20.7	23.4
FNAT	RH	78	0	100	6.0	20.0	20.9
GCGJ	RH	72	0	100	4.8	17.3	17.9
H9TO	RH	40	0	100	8.7	21.0	22.7
PJVQ	RH	28	0	100	8.8	-18.6	20.6
P3BK8	RH	41	0	100	7.6	15.3	17.1
VHA2364	RH	28	0	100	6.4	15.0	16.3
VJBF	RH	30	0	100	6.6	16.3	17.6
ZSWAV1	RH	32	0	100	9.5	-30.2	31.7
3EZF5	RH	81	0	100	10.9	23.7	26.1
62105	RH	59	0	100	5.2	19.0	19.7
62402	RH	38	0	100	13.2	-19.2	23.3

IDENTIFIER	ELEM	NOBS	PGE	%REJ	SD	BIAS	RMS
C6KJ5	SST	35	0	100	0.9	3.1	3.2
ELXQ7	SST	29	28	48	3.1	2.4	3.9
ELZH9	SST	37	0	100	0.7	6.7	6.7
ELZL5	SST	21	5	38	2.5	-3.4	4.2
FNJI	SST	69	0	100	0.6	3.1	3.2
HPNE	SST	38	26	26	0.6	1.8	1.9
KGJD	SST	318	74	100	5.3	-2.5	5.9
KRPB	SST	35	0	57	1.0	-3.0	3.2
KS003	SST	98	100	100			
PFEI	SST	22	0	18	1.5	3.1	3.4
PHPO	SST	20	5	30	0.5	-3.6	3.6
PPSV	SST	33	0	100	1.5	-3.9	4.2
S6IW	SST	48	0	92	3.9	4.1	5.6
VOCJ	SST	153	3	100	2.0	5.3	5.6
WAAH	SST	37	0	100	1.6	3.0	3.4
WAUY	SST	37	0	46	1.9	-3.2	3.7
44011	SST	452	0	48	1.0	-3.0	3.1
44161	SST	102	0	67	0.8	3.6	3.7
45008	SST	152	0	100	0.9	-5.4	5.4
45139	SST	371	0	98	3.0	-5.2	6.0
45149	SST	352	0	100	0.8	-6.0	6.1
45151	SST	66	0	100	0.7	4.9	5.0
46025	SST	151	0	54	1.4	3.1	3.4

Figure 1. SHIP/SYNOP mean daily count. MAY 2004
All hours
Global average number of observations in 24 hours = 20631

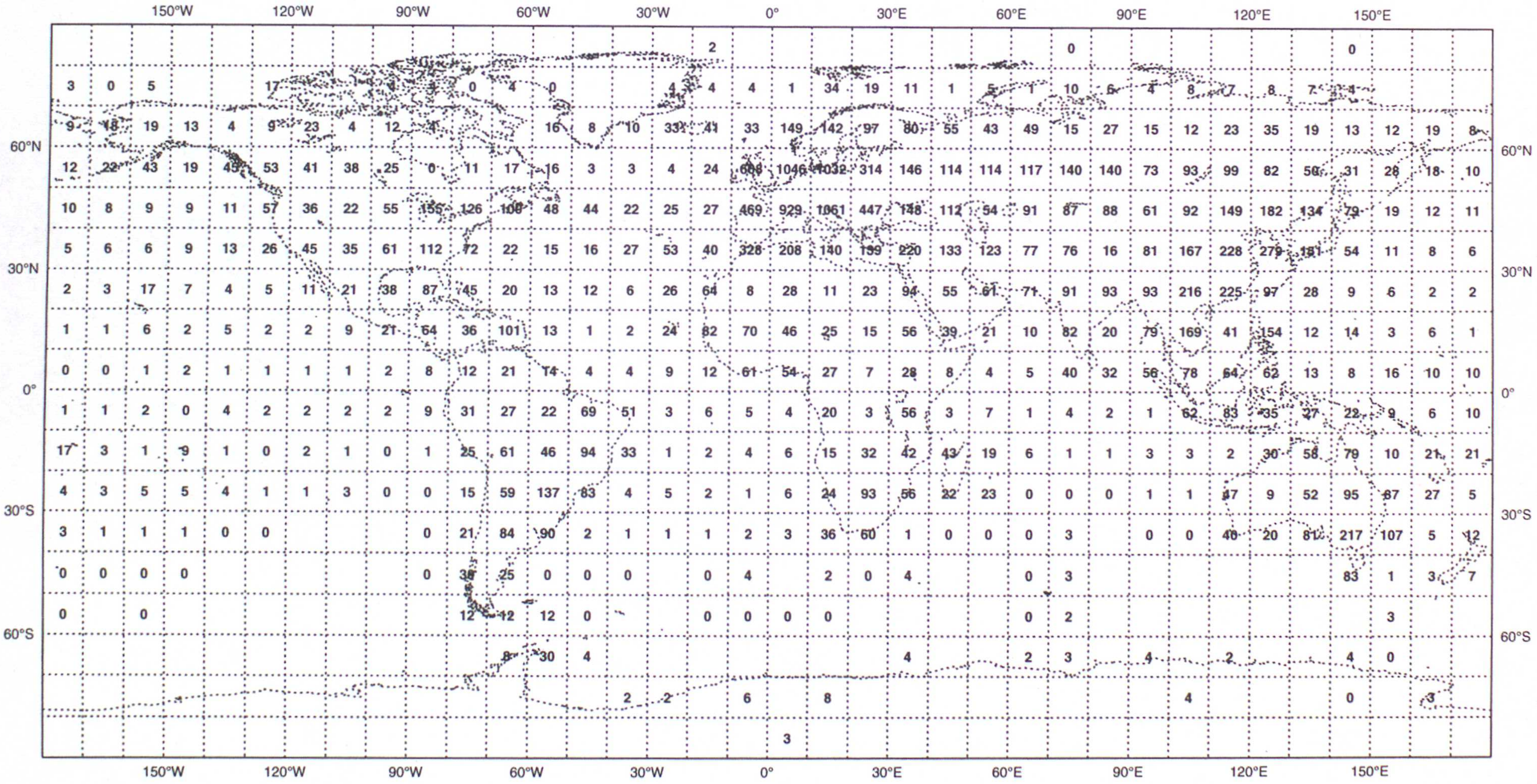

150°W
120°W
90°W
60°W
30°W
0°
30°E
60°E
90°E
120°E
150°E
60°N
30°N
0°
30°S
60°S

TABLE 2

MONITORING OF MARINE SURFACE OBSERVATIONS
MONTHLY SUSPECT LIST - DRIFTING BUOYS
MONITORING CENTRE: EXETER
MONTH: May 2004

Monitoring procedures

Period		:One calendar month.	
Data monitored		:Reports from each unique identifier for drifting buoys.	
Standard of comparison		:Background field from UKMO global model.	
Position		:Average latitude and longitude for period.	
Observation times		: All hours	
Elements monitored		:Mean sea level pressure (hPa). :Wind speed (m s^{-1}). :Wind direction (degrees). :Sea surface temperature (degrees).	
Parameters monitored	:NOBS	:Number of observations received excluding duplicates.	
	:PGE	:Percentage of observations with gross errors.	
	:%REJ	: Percentage of observations flagged excluding those with gross errors	
	:SD	:SD of difference of observations from background values excluding those with gross errors.	
	:BIAS	:Mean difference of observations from background values excluding those with gross errors. **N.B. a positive bias indicates the wind observation is veered to the background.**	
	:RMS	:Root Mean Square difference of observations from background values excluding those with gross errors.	
GROSS ERROR LIMIT	:15 hPa	(pressure)	
	:25 m s^{-1}	(vector wind)	
	:10 degrees	(sea surface temperature)	
SELECTION CRITERIA :	NOBS	≥ 20 , and one or more of the following:	
	1.|bias|	≥ 4 hPa	(pressure),
		≥ 5 m s^{-1}	(wind speed),
		≥ 30 degrees	(direction).
		≥ 3 degrees	(sea surface temperature).
	2.SD	≥ 6 hPa	(pressure),
		≥ 80 degrees	(direction).
		≥ 5 degrees	(sea surface temperature).
	3.PGE	≥ 25.	

N.B. Observations of wind direction are only included in the wind direction statistics if the observed OR background wind speed > 5 m s^{-1}

IDENTIFIER	LAT.	LONG.	ELEM	NOBS	PGE	%REJ	SD	BIAS	RMS
14925	-24.6	65.4	P	48	54	100	1.4	9.0	9.1
25572	87.5	-132.1	P	236	72	90	5.1	7.3	9.0
52650	16.9	128.8	P	235	46	49	2.6	1.6	3.1
55613	-48.3	-148.2	P	221	20	87	9.9	-2.0	10.1
56558	-49.9	92.0	P	667	3	100	4.4	4.1	6.0

IDENTIFIER	LAT.	LONG.	ELEM	NOBS	PGE	%REJ	SD	BIAS	RMS
52523	20.0	124.4	DIRN.	154	1	0	65.9	33.1	73.8
52651	24.8	146.2	DIRN.	163	0	0	17.8	30.5	35.3

IDENTIFIER	LAT.	LONG.	ELEM	NOBS	PGE	%REJ	SD	BIAS	RMS
22935	24.2	123.9	SST	20	40	45	2.1	0.6	2.2
32693	9.3	-135.8	SST	417	0	100	0.3	3.3	3.3
44509	47.6	-48.8	SST	97	13	90	4.1	3.4	5.4
44510	50.5	-50.6	SST	191	27	94	0.4	0.2	0.4
44511	41.7	-48.8	SST	213	0	100	1.5	-6.7	6.8
46972	19.4	-179.4	SST	113	0	100	0.3	4.6	4.6
52837	-2.3	173.3	SST	146	1	58	2.5	3.1	4.0
62576	45.4	-8.1	SST	277	0	80	4.5	-3.9	6.0
71629	-58.6	-48.4	SST	352	5	56	3.8	4.2	5.6

Figure 2. DRIFTER mean daily count. MAY 2004
All hours
Global average number of observations in 24 hours = 11355

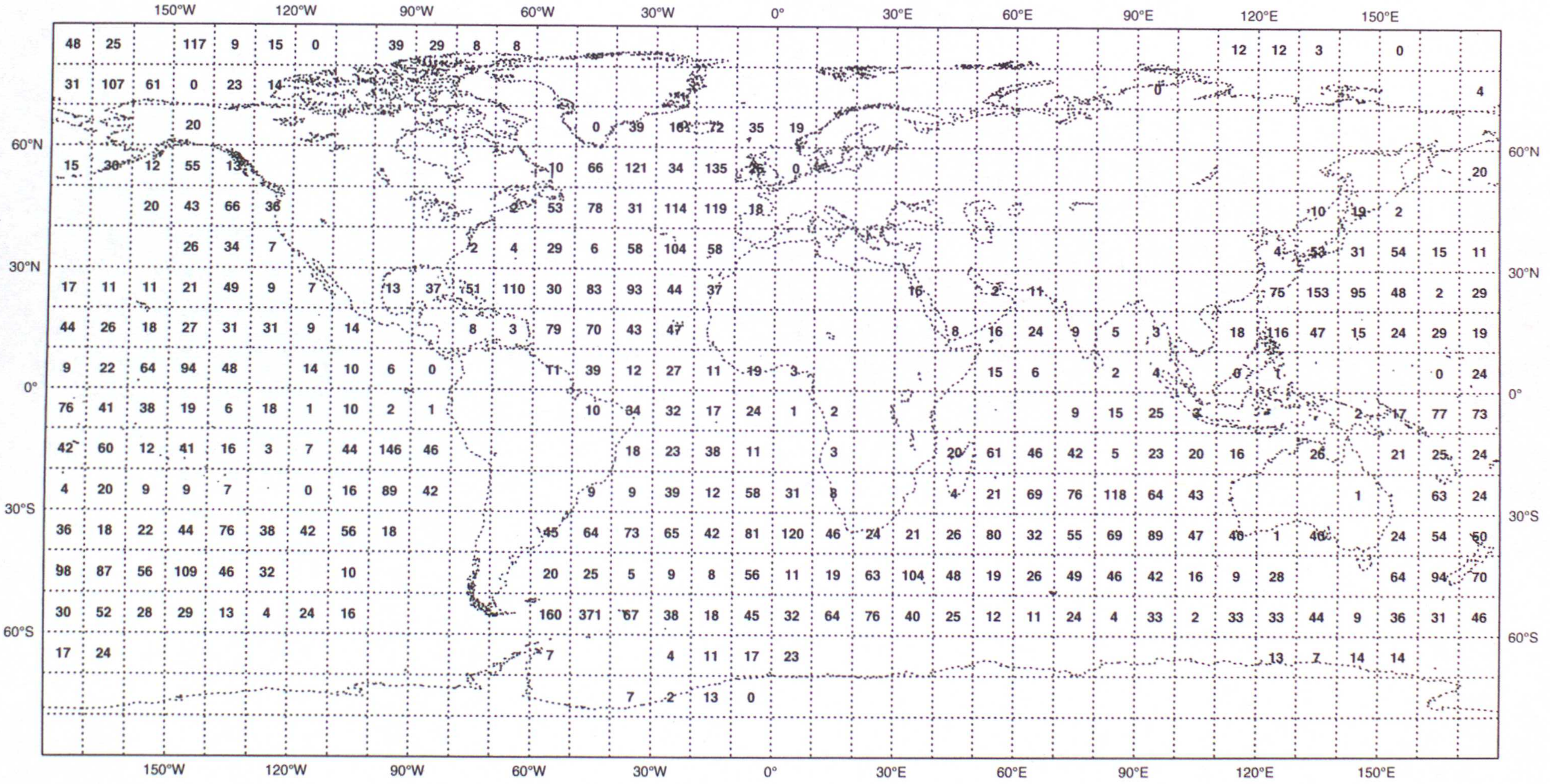

150°W
120°W
90°W
60°W
30°W
0°
30°E
60°E
90°E
120°E
150°E
60°N
30°N
0°
30°S
60°S
48 25 117 9 15 0 39 29 8 8 12 12 3 0
31 107 61 0 23 14 0 4
20 0 39 161 72 35 19
15 30 12 55 13 10 66 121 34 135 26 0 20
20 43 66 36 2 53 78 31 114 119 18 10 19 2
26 34 7 2 4 29 6 58 104 58 4 53 31 54 15 11
17 11 11 21 49 9 7 13 37 151 110 30 83 93 44 37 16 2 11 75 153 95 48 2 29
44 26 18 27 31 31 9 14 8 3 79 70 43 47 8 16 24 9 5 3 18 116 47 15 24 29 19
9 22 64 94 48 14 10 6 0 11 39 12 27 11 19 3 15 6 2 4 0 1 0 24
76 41 38 19 6 18 1 10 2 1 10 84 32 17 24 1 2 9 15 25 2 2 17 77 73
42 60 12 41 16 3 7 44 146 46 18 23 38 11 3 20 61 46 42 5 23 20 16 26 21 25 24
4 20 9 9 7 0 16 89 42 9 9 39 12 58 31 8 4 21 69 76 118 64 43 1 63 24
36 18 22 44 76 38 42 56 18 45 64 73 65 42 81 120 46 24 21 26 80 32 55 69 89 47 40 1 46 24 54 50
98 87 56 109 46 32 10 20 25 5 9 8 56 11 19 63 104 48 19 26 49 46 42 16 9 28 64 94 70
30 52 28 29 13 4 24 16 160 371 67 38 18 45 32 64 76 40 25 12 11 24 4 33 2 33 33 44 9 36 31 46
17 24 7 4 11 17 23 13 7 14 14
7 2 13 0

TABLE 3

MONITORING OF LAND SURFACE OBSERVATIONS
MONTHLY SUSPECT LIST - SYNOPS & AUTOSYNOPS
MONITORING CENTRE: EXETER
MONTH: May 2004

Monitoring procedures

Period		:One calendar month.
Data monitored		:Reports from each unique identifier for synops & autosynops.
Standard of comparison		:Background field from UKMO global model.
Observation times		:00, 06, 12, 18 UTC
Elements monitored		:Surface pressure (hPa).
Parameters monitored	:HT(m)	:Station height (in metres) as given in WMO No. 9 Vol A
	:RP	:Pressure reporting practice M=mean sea level pressure (hPa) reported. S=Station level pressure reported. 8=Geopotential height (m) of 850 hPa surface reported. 7=Geopotential height (m) of 700 hPa surface reported.
	:NOBS	:Number of observations received excluding duplicates.
	:NGE	:Number of observations with gross errors.
	:PGE	:Percentage of observations with gross errors.
	:%REJ	:Percentage of observations flagged excluding those with gross errors.
	:SD	:SD of difference of observations from background values excluding those with gross errors.
	:BIAS	:Mean difference of observations from background values excluding those with gross errors.
	:RMS	:Root Mean Square difference of observations from background values excluding those with gross errors.
GROSS ERROR LIMIT	:15 hPa	(pressure)
SELECTION CRITERIA	:NOBS	≥ 20 ,and one or more of the following:
	1.|bias|	≥ 4 hPa
	2. SD	≥ 6 hPa
	3.PGE	≥ 25.

N.B. For stn ht ≥ 500m, mslp is that calculated from station level pressure where available.
For stn ht < 500m, mslp is that as reported by the station where available.

SUSPECT SYNOPS (PRESSURE) BY WMO REGION   MAY 200

WMO REGION 1:

STATION	LAT	LONG	HT(M)	RP	NOBS	NGE	PGE	%REJ	SD	BIAS	RMS
60320	35.9N	5.3W	2	MS	59	0	0	0	1.0	-9.9	10.0
62056	32.8N	21.8E	625	S8	80	3	4	0	1.1	-5.8	5.9
62840	9.6N	31.6E	387	MS	67	0	0	13	3.0	-4.4	5.3
63330	13.5N	39.5E	2070	MS	23	22	96	0	0.0	-14.3	14.3
63801	4.9S	29.6E	882	S8	68	0	0	0	0.6	7.9	7.9
63881	8.0S	31.6E	1923	S	47	1	2	0	3.6	11.0	11.6
65355	9.8N	1.1E	342	MS	108	1	1	3	1.8	-11.9	12.0
67229	14.7S	34.3E	1270	S8	37	10	27	0	3.5	12.6	13.1
68030	18.5S	25.6E	1071	S8	76	0	0	0	3.4	5.1	6.1
68300	26.6S	15.1E	16	MS	112	61	54	0	0.6	-14.3	14.3
68396	26.5S	31.3E	641	S	57	0	0	0	0.8	4.6	4.7
68575	30.0S	30.0E	1175	S8	120	120	100	0			

WMO REGION 2:

STATION	LAT	LONG	HT(M)	RP	NOBS	NGE	PGE	%REJ	SD	BIAS	RMS
30554	54.5N	113.6E	995	MS	121	0	0	0	0.8	11.8	11.8
35416	49.1N	54.7E	128	S	116	0	0	0	0.7	4.0	4.1
36982	41.9N	78.2E	3635	S7	75	1	1	3	1.1	6.5	6.6
38565	40.6N	65.7E	485	MS	119	119	100	0			
38846	38.4N	70.0E	1437	S8	87	3	3	0	1.0	-5.9	6.0
40435	24.5N	44.4E	991	MS	58	1	2	3	1.7	7.7	7.9
40700	39.6N	47.9E	45	MS	111	0	0	3	2.1	-5.1	5.5
40713	37.4N	46.3E	1475	MS	117	11	9	0	0.7	13.0	13.0
40741	36.5N	61.2E	235	MS	112	0	0	1	1.3	-4.4	4.6
40743	36.2N	57.7E	978	MS	117	0	0	1	1.4	4.0	4.2
40780	33.6N	46.4E	1362	MS	111	0	0	1	0.9	5.1	5.2
41254	23.1N	57.6E	1755	S8	74	74	100	0			
47022	40.8N	128.2E	1224	S	98	1	1	0	1.1	4.2	4.3
47678	33.1N	139.8E	79	MS	121	1	1	1	0.7	-9.2	9.2
48924	21.1N	101.5E	644	S	24	0	0	4	1.4	10.7	10.8
48925	20.7N	102.0E	550	S	23	0	0	0	1.0	-10.0	10.0
48938	19.2N	101.7E	326	MS	23	9	39	0	0.4	14.3	14.3
50727	47.2N	119.9E	1028	MS	121	0	0	0	0.8	4.6	4.7
50978	45.3N	131.0E	234	MS	121	0	0	0	0.8	-5.5	5.6
52866	36.6N	101.8E	2262	S	121	0	0	0	1.0	-4.4	4.5
53646	38.2N	109.7E	1058	MS	121	0	0	0	0.7	-11.5	11.5
56462	29.0N	101.5E	2994	S	121	0	0	0	1.3	8.8	8.9
56768	25.0N	101.5E	1773	S	121	0	0	0	0.8	-5.3	5.4
57816	26.6N	106.7E	1074	MS	121	51	42	0	0.4	-14.4	14.4
59663	21.9N	112.0E	22	MS	121	0	0	0	0.6	-7.0	7.0

WMO REGION 3:

STATION	LAT	LONG	HT(M)	RP	NOBS	NGE	PGE	%REJ	SD	BIAS	RMS
80434	9.2N	66.0W	125	MS	42	2	5	0	1.3	-4.9	5.1
82181	2.0S	54.1W	146	MS	86	0	0	0	0.9	5.1	5.2
82704	7.6S	72.7W	170	MS	75	0	0	1	1.6	-4.6	4.9
83235	12.4S	46.4W	604	MS	91	0	0	0	0.6	6.1	6.1
83332	14.1S	46.4W	826	MS	90	1	1	1	0.7	13.6	13.6
83470	17.9S	50.9W	727	MS	91	2	2	1	0.7	-5.7	5.7
83531	18.6S	46.5W	940	MS	91	1	1	3	1.2	-6.7	6.8
83738	22.5S	44.5W	440	MS	90	42	47	7	2.6	-13.5	13.7
83836	25.5S	50.6W	837	MS	91	0	0	1	0.9	-5.1	5.2
84425	5.9S	76.1W	179	MS	22	0	0	0	1.0	4.4	4.5

84455	6.5S	76.4W	281	MS	79	0	0	1	1.6	7.2	7.4
84472	7.1S	78.5W	2620	S	50	0	0	0	0.7	-5.0	5.0
84474	7.2S	76.7W	350	S	20	0	0	0	1.0	9.4	9.5
84686	13.6S	72.0W	3248	S	104	0	0	0	0.9	-4.2	4.3
84688	13.7S	73.4W	3444	S	42	0	0	0	0.5	-12.2	12.2
84720	14.9S	75.0W	567	MS	50	0	0	0	0.7	4.8	4.9
84782	18.1S	70.3W	468	MS	79	0	0	0	1.4	7.2	7.3
85140	14.3S	67.4W	140	MS	59	0	0	2	1.2	6.6	6.7
85264	18.5S	64.1W	1998	S	60	0	0	3	1.0	5.3	5.4
85312	19.8S	63.9W	992	S	45	3	7	2	1.0	-12.3	12.3
85432	22.5S	68.9W	2320	S8	80	0	0	0	0.7	4.2	4.3

WMO REGION 4:

STATION	LAT	LONG	HT(M)	RP	NOBS	NGE	PGE	%REJ	SD	BIAS	RMS
71060	52.5N	116.1W	230	MS	119	119	100	0			
71181	47.1N	55.3W	29	MS	120	0	0	0	0.7	-6.2	6.2
71506	67.0N	136.2W	720	MS	119	0	0	0	1.3	-4.0	4.2
71619	48.0N	65.3W	46	MS	355	219	62	0	3.8	-0.9	3.9
72327	36.1N	86.7W	182	MS	118	0	0	0	0.8	4.0	4.1
76055	31.0N	114.9W	440	MS	28	28	100	0			
76225	28.6N	106.1W	1435	MS	33	1	3	0	0.6	-4.6	4.6
76762	17.5N	99.5W	1265	MS	21	0	0	0	0.7	5.8	5.8
78588	17.2N	87.5W	-281	M	119	115	97	0	0.3	0.0	0.3
78655	14.0N	89.6W	725	S	59	1	2	0	0.9	11.1	11.1

WMO REGION 5:

STATION	LAT	LONG	HT(M)	RP	NOBS	NGE	PGE	%REJ	SD	BIAS	RMS
94130	14.8S	131.9E	120	MS	121	0	0	0	1.0	5.2	5.3
96505	3.7N	115.7E	-9999	8	28	28	100	0			
97378	10.7S	123.1E	1	MS	46	45	98	0	0.0	-14.8	14.8
98851	6.1N	125.2E	14	S	91	7	8	100	0.8	-13.3	13.3

WMO REGION 6:

STATION	LAT	LONG	HT(M)	RP	NOBS	NGE	PGE	%REJ	SD	BIAS	RMS
01292	63.4N	11.8E	239	MS	40	0	0	65	3.8	5.5	6.7
01360	61.9N	7.9E	711	MS	120	0	0	0	0.7	6.0	6.0
06685	47.0N	9.1E	515	MS	119	0	0	2	1.0	6.2	6.3
06780	46.8N	9.8E	2690	S7	119	0	0	0	0.7	4.1	4.2
08912	42.9N	0.8W	1434	MS	110	110	100	0			
08922	42.8N	0.2W	1660	MS	109	109	100	0			
10850	48.8N	10.7E	457	MS	362	0	0	0	0.4	-5.4	5.4
11116	47.5N	10.8E	870	MS	59	1	2	0	0.7	4.4	4.5
13269	44.3N	19.9E	176	MS	112	0	0	0	0.7	7.7	7.7
14554	44.9N	18.4E	136	S	60	1	2	0	0.6	-13.4	13.4
16204	42.9N	11.8E	816	S	73	0	0	0	0.6	4.1	4.1
16344	39.3N	16.4E	1710	S8	118	0	0	3	1.5	4.4	4.6
16538	40.1N	9.3E	1022	S	39	0	0	0	0.8	9.0	9.0
17088	40.5N	39.5E	1219	S8	117	0	0	2	1.3	4.9	5.1
17203	38.9N	40.5E	1177	S8	118	0	0	0	1.2	4.8	4.9
17521	35.2N	33.5E	285	MS	87	87	100	100			
37018	44.1N	39.0E	95	MS	117	0	0	3	1.3	5.2	5.4

ANTARCTIC:

STATION	LAT	LONG	HT(M)	RP	NOBS	NGE	PGE	%REJ	SD	BIAS	RMS
89004	71.7S	2.8W	815	MS	104	0	0	0	1.8	-6.7	6.9
89257	75.4S	59.9W	40	S	828	0	0	0	1.8	-6.6	6.8
89263	66.0S	66.1W	20	M	242	14	6	0	1.4	12.5	12.6
89264	71.4S	68.9W	780	S	277	0	0	0	1.5	7.5	7.6
89266	72.2S	60.2W	91	S	260	257	99	0	6.6	-5.6	8.7

89272	75.0S	70.8W	1395	S	273	273	100	0			
89610	65.9S	113.1E	90	S	246	0	0	0	1.1	-8.1	8.2
89614	66.6S	111.2E	500	S	256	256	100	0			
89744	74.0S	43.1E	3353	S	287	0	0	0	0.9	7.6	7.7
89811	66.7S	112.8E	1366	S	264	0	0	0	1.3	-4.4	4.6
89847	67.6S	146.2E	30	S	57	0	0	33	2.9	-10.0	10.4

TABLE 4A

MONTHLY MONITORING OF AIRCRAFT OBSERVATIONS
MONITORING CENTRE: EXETER
MONTH: May 2004

Monitoring procedures

Period :One calendar month.

Data monitored :Statistics for each airline carrier.

Area monitored :90°N - 90°S, 180°W - 180°E.

Standard of comparison :Background field from UKMO global model.

Observation times :All hours combined.

Level(s) monitored :300.0 - 150.0 hPa

Elements monitored :TEMP in °C ; WIND in m s^{-1}

Parameters monitored

:N REP. :Number of observations received excluding duplicates.

:PG :Percentage of observations with gross errors.

:PR :Percentage of observations rejected by quality control including rejections from the duplicate check.

:PC :Percentage of observations with calm winds.

:RMS :Root Mean Square difference of observations from background values excluding those with gross errors in Temperature & vector wind.

:BIAS :Mean difference of observations from background values excluding those with gross errors in Temperature & Wind Speed.

GROSS ERROR LIMITS :10.0 °C ; 60 m s^{-1} Vector Wind

SELECTION CRITERIA :N REP ≥ 20

NB : All American ACARS data are grouped together and statistics are shown at the bottom of the table as "US ACARS".

IDENT.	TEMPERATURE N.REP.	PG	PR	RMS	BIAS	WIND N.REP.	PG	PR	PC	RMS	BIAS
AAH	3257	0	42	1.4	-0.1	3226	0	41	0	5.7	0.3
AAL	6825	0	38	1.5	0.1	6428	0	39	0	6.0	0.1
AAR	1635	1	7	1.6	-0.3	1614	1	9	0	8.4	0.2
ACA	2513	1	12	1.7	0.0	2017	0	13	0	8.0	0.4
ACI	98	0	6	1.3	0.3	98	0	6	0	5.6	0.1
ADB	25	0	12	3.3	-1.4	25	0	4	0	7.6	-0.7
AEA	1086	0	3	1.3	0.1	778	0	4	0	7.4	-0.1
AEL	263	1	8	1.9	-0.2	217	0	9	0	7.1	1.0
AEW	80	1	6	1.5	-0.4	31	0	3	0	7.9	0.3
AFL	658	0	3	1.8	0.0	364	0	3	0	7.1	1.3
AFR	1403	0	7	1.4	0.1	1288	0	10	0	8.3	0.1
AJM	407	0	3	1.3	-0.3	329	0	3	0	6.4	0.6
AJX	267	0	5	1.6	0.7	269	0	6	0	6.9	-0.5
AMT	1890	1	43	1.1	0.0	1884	0	43	0	6.0	0.0
AMX	415	2	7	2.1	0.4	348	0	100	0	9.9	0.1
ANA	46	2	4	1.7	0.0	46	0	7	0	6.5	-0.1
ANZ	5135	0	28	1.5	0.1	5113	0	28	0	7.3	0.7
ARG	55	5	29	1.9	0.1	37	0	41	0	13.3	-0.5
ASA	25	4	24	3.8	-0.3	25	0	40	0	19.2	-4.5
ATN	178	1	100	3.0	-0.4	164	0	47	0	11.3	1.8
AVA	293	1	7	2.0	0.4	260	0	5	0	9.2	0.5
AVN	152	0	46	1.8	-0.2	153	0	45	0	7.1	0.5
AZA	632	1	7	2.0	0.2	524	0	6	0	9.0	-0.7
BAF	47	0	2	1.9	-0.9	35	0	0	0	5.9	2.1
BAL	385	1	9	1.5	0.1	375	0	10	0	6.6	-0.1
BAW	653	0	13	1.9	-0.6	477	0	10	0	6.5	0.3
BBR	195	1	2	1.3	0.3	169	1	12	0	14.3	2.8
BPA	406	0	8	1.8	-0.6	395	0	9	0	6.9	0.3
BSK	26	0	12	1.9	0.1	26	0	12	0	6.5	0.0
BWA	371	1	4	1.5	-0.2	310	0	6	0	8.9	0.1
CAL	72	0	3	1.6	0.1	72	0	3	0	7.8	0.3
CCA	378	1	15	2.3	0.1	376	2	100	0	13.3	-0.5
CES	464	1	6	1.7	0.1	461	2	8	0	9.2	0.7
CFC	27	4	7	1.2	-0.2	26	0	4	0	7.8	0.8
CFG	830	1	6	1.4	-0.1	712	0	5	0	7.2	-0.4
CKK	125	2	18	1.9	0.2	130	0	18	0	11.3	0.5
CKS	452	0	31	1.7	0.4	384	1	34	0	8.6	0.5
CLX	408	0	5	1.7	-0.5	267	0	5	0	6.0	0.3
COA	261	2	31	1.5	0.2	214	0	31	0	8.9	-0.2
CPA	20	5	30	1.6	-0.3	22	0	32	0	6.8	0.7
CRL	642	1	4	1.4	0.7	561	0	5	0	8.2	-0.1
CSN	85	2	14	2.2	0.0	85	0	16	0	11.0	1.1
CST	22	0	18	2.4	-1.3	21	5	19	0	15.6	-3.4
CTM	30	0	10	0.9	-0.2	28	0	11	0	5.0	0.4
CUB	228	1	3	1.5	-0.3	202	0	6	0	9.1	0.2
DAL	3985	0	35	1.5	0.0	3458	0	39	0	5.7	0.1
DCE	64	0	9	1.9	0.7	58	0	12	0	10.4	-2.2
DHL	143	1	100	6.1	-5.9	83	0	100	0	11.6	2.6
DLH	1143	1	17	1.6	-0.2	1086	0	17	0	7.5	0.4
EDW	79	0	3	1.3	-0.4	67	0	6	0	7.0	0.6
EEZ	71	0	10	1.7	0.0	70	0	10	0	7.3	0.6
EIA	421	1	100	2.8	0.5	370	0	100	0	18.9	5.2
ELY	105	1	2	1.4	-0.3	86	0	2	0	8.1	-0.6
ETH	34	0	26	2.4	0.4	35	0	20	0	6.9	1.1
EVA	184	1	4	1.7	-0.1	203	0	6	0	9.9	0.5
FCA	239	0	1	1.3	0.2	209	0	3	0	6.7	0.1
FDX	1865	0	44	1.3	0.3	1721	0	44	0	7.1	0.4
FIN	175	1	5	1.8	0.2	128	0	2	0	6.3	0.4
FJI	834	2	36	1.7	0.8	830	0	36	0	8.2	-0.1

		TEMPERATURE				WIND					
IDENT.	N.REP.	PG	PR	RMS	BIAS	N.REP.	PG	PR	PC	RMS	BIAS
FOM	778	0	28	1.5	-0.1	771	0	29	0	7.8	0.2
FWI	554	1	2	1.3	-0.3	535	0	4	0	7.4	0.1
GAF	91	0	0	1.8	-1.2	52	0	2	0	5.2	0.1
GCO	121	0	15	1.5	0.2	118	0	14	0	8.4	0.6
GHA	57	0	7	1.8	-0.4	52	0	17	0	17.2	-2.5
GRL	49	0	2	1.5	0.2	35	0	0	0	4.3	0.8
GTI	216	0	17	1.9	0.4	209	0	20	0	8.7	1.3
HAL	4817	0	41	1.3	0.3	4779	0	42	0	6.1	0.0
HXL	309	1	6	1.5	0.5	257	0	7	0	7.5	0.6
IBE	3750	1	4	1.4	0.3	3378	0	6	0	8.9	-0.4
ICE	1091	1	6	1.7	-0.1	694	0	5	0	6.3	1.1
IWD	458	0	4	1.4	-0.1	420	0	5	0	7.3	0.1
JAL	2830	0	4	1.6	0.6	2812	0	5	0	7.7	-0.1
JAZ	672	0	6	1.3	0.6	666	0	6	0	6.8	-0.1
JBU	62	2	2	0.8	0.0	62	0	3	0	6.6	-1.0
KAL	2149	1	7	1.7	0.0	2155	1	8	0	7.8	0.2
KLM	1693	0	5	1.5	0.1	1251	0	7	0	7.1	-0.1
LAN	499	0	5	1.6	-0.3	496	0	6	0	5.8	0.4
LAP	92	1	50	2.2	0.1	89	0	49	0	9.2	0.5
LDI	406	1	3	1.5	0.0	322	0	3	0	7.4	0.0
LLB	27	22	30	2.7	0.7	22	0	18	0	13.7	1.2
LNE	113	1	4	1.7	-0.2	95	1	5	0	9.0	-1.1
LOT	202	0	2	1.7	-1.2	141	0	5	0	7.1	0.6
LTU	977	1	5	1.5	-0.2	776	0	4	0	6.4	0.4
MAS	383	1	4	1.6	0.1	369	0	3	0	6.3	0.5
MON	49	0	2	1.2	0.1	27	0	4	0	7.4	0.6
MPD	423	1	3	1.7	0.3	360	1	2	0	5.7	0.1
MPH	679	0	3	1.6	-0.9	498	0	4	0	7.4	0.1
MXA	114	4	17	2.8	0.4	112	0	12	0	11.9	-0.6
MYT	316	1	3	1.4	-0.2	253	0	4	0	6.3	0.3
NAO	357	1	36	1.4	0.1	354	0	37	0	7.1	0.2
NCA	999	0	3	1.8	0.0	727	1	6	0	7.2	0.3
NWA	7857	0	12	1.5	0.2	7759	0	12	0	7.6	0.2
NZL	3734	0	7	1.3	0.0	3733	0	7	0	5.5	0.4
OAE	654	0	39	1.0	-0.2	597	0	89	0	8.7	1.0
OOM	203	0	9	2.3	-1.5	118	0	8	0	8.0	1.0
PAC	540	0	15	1.8	-0.1	460	0	16	0	7.6	0.6
PAL	1603	0	12	1.4	0.1	1540	0	12	0	7.7	0.5
PAO	289	0	46	1.4	-0.3	289	0	47	0	8.7	0.7
PBI	492	1	28	1.9	0.0	491	0	27	0	5.9	0.7
PLM	246	0	2	1.6	1.1	182	1	2	0	8.0	0.5
PUA	46	4	33	1.8	-0.3	45	4	42	0	20.5	3.2
QFA	4480	0	46	1.4	0.4	4468	0	47	0	6.5	0.7
QQA	49	2	49	1.1	0.2	49	0	47	0	7.1	1.8
RAM	299	0	4	1.8	0.6	197	0	6	0	8.4	-0.1
RCH	246	1	100	3.8	-0.5	199	0	100	0	12.2	0.8
RJA	29	0	3	1.6	-0.7	21	0	5	0	8.0	1.7
RRR	164	0	9	2.0	-0.4	160	1	10	0	7.5	0.3
RYN	45	0	100	1.5	-0.8	45	0	38	0	5.0	-0.1
RZO	636	0	3	1.6	-0.7	545	0	4	0	7.3	0.8
SAA	78	3	12	1.3	-0.4	71	0	10	0	12.6	-2.5
SEU	224	0	3	1.4	-0.1	209	0	4	0	7.4	-0.6
SIA	406	0	2	1.5	0.3	407	0	2	0	5.3	0.2
SOO	27	0	0	1.4	-0.1	38	0	3	0	6.1	0.1
SQC	37	0	0	1.1	0.3	37	0	0	0	5.6	-0.8
SSV	35	3	11	1.2	-0.1	22	0	14	0	4.3	1.4
SVA	25	4	12	1.1	0.2	20	0	15	0	7.9	0.7
SVH	84	0	2	1.5	1.1	84	0	2	0	4.8	0.5
TAG	36	0	22	1.7	-0.1	36	0	31	0	13.5	1.1

	TEMPERATURE					WIND					
IDENT.	N.REP.	PG	PR	RMS	BIAS	N.REP.	PG	PR	PC	RMS	BIAS
TAM	78	8	32	2.7	0.5	77	0	32	0	15.4	1.8
TAP	656	1	5	1.6	-0.6	494	0	6	0	7.3	-0.3
TCX	78	1	5	1.5	0.4	46	0	2	0	5.2	0.4
THA	210	0	5	1.6	0.1	207	0	6	0	7.6	0.3
THT	114	0	31	1.4	0.3	110	0	30	0	5.5	0.8
TPA	44	0	2	1.1	0.2	38	0	0	0	4.8	0.7
TSC	172	2	6	1.9	-0.7	102	1	4	0	7.1	1.9
UAE	532	0	6	1.5	0.1	533	0	6	0	5.3	0.4
UAL	187409	0	95	1.0	-0.1	187297	0	95	0	5.0	0.4
UPS	2019	0	55	1.5	0.0	1989	0	55	0	7.3	0.5
USA	124	2	6	1.3	0.0	116	1	3	0	5.6	-0.8
VHF	28	0	0	1.9	0.0	29	0	3	0	12.1	-1.3
VIR	156	1	6	1.9	-0.1	91	0	4	0	8.2	0.9
VPB	43	0	7	3.0	0.7	34	0	0	0	8.5	1.5
VRG	208	3	42	2.2	0.8	206	0	100	0	13.2	0.5
VVJ	30	7	43	1.9	0.0	32	0	38	0	10.3	4.8
VVR	87	0	41	2.3	0.6	87	0	43	0	7.8	2.3
WOA	391	1	13	1.6	0.2	335	1	17	0	10.5	0.8
XLA	175	1	7	1.7	0.1	165	0	6	0	7.8	-0.6
YSS	112	0	0	1.1	0.6	97	0	1	0	5.8	-0.3

	TEMPERATURE					WIND					
IDENT.	N.REP.	PG	PR	RMS	BIAS	N.REP.	PG	PR	PC	RMS	BIAS
AU	38182	0	9	1.4	0.5	38210	0	10	0	5.6	0.6
EU	212290	0	26	1.3	0.2	212290	0	25	0	4.4	0.4
HK	3597	0	23	1.3	0.3	3597	0	23	0	5.3	0.4
KL	1997	0	1	1.9	1.6	1997	0	1	0	6.9	0.2
MK	2833	0	5	1.6	1.3	2771	0	5	0	7.1	2.1
SA	3496	0	6	1.2	0.4	3496	0	6	0	6.1	0.7
TN	35	0	17	2.2	1.8	31	0	16	0	8.1	0.5

	TEMPERATURE					WIND					
IDENT.	N.REP.	PG	PR	RMS	BIAS	N.REP.	PG	PR	PC	RMS	BIAS
N	1102	1	19	2.2	0.2	883	0	22	0	7.9	0.8
US ACARS	912864	0	61	1.2	0.4	912855	0	61	0	5.3	0.6

TABLE 4B

MONTHLY MONITORING OF AIRCRAFT OBSERVATIONS
MONITORING CENTRE: EXETER
MONTH: May 2004

Monitoring procedures

Period :One calendar month.

Data monitored :Statistics for each airline carrier.

Area monitored :90°N - 90°S, 180°W - 180°E.

Standard of comparison :Background field from UKMO global model.

Observation times :All hours combined.

Level(s) monitored :1000.0 – 300.1 hPa

Elements monitored :TEMP in °C ; WIND in m s^{-1}

Parameters monitored

:N REP. :Number of observations received excluding duplicates.

:PG :Percentage of observations with gross errors.

:PR :Percentage of observations rejected by quality control including rejections from the duplicate check.

:PC :Percentage of observations with calm winds.

:RMS :Root Mean Square difference of observations from background values excluding those with gross errors in Temperature & vector wind.

:BIAS :Mean difference of observations from background values excluding those with gross errors in Temperature & Wind Speed.

GROSS ERROR LIMITS :10.0 °C ; 60 m s^{-1} Vector Wind

SELECTION CRITERIA :N REP $\geq$ 20

NB: All American ACARS data are grouped together and statistics are shown at the bottom of the table as "US ACARS".

		TEMPERATURE				WIND					
IDENT.	N.REP.	PG	PR	RMS	BIAS	N.REP.	PG	PR	PC	RMS	BIAS
AAL	410	1	37	1.5	-0.2	379	0	38	0	6.2	0.8
AAR	20	0	20	2.2	-1.4	20	0	20	0	5.3	0.4
ACA	70	1	31	2.2	-0.5	64	0	28	0	10.9	0.7
AFR	56	2	7	1.0	-0.2	53	0	6	0	5.4	0.2
AMT	40	3	25	1.3	0.5	39	0	26	0	7.6	0.6
ANZ	165	1	24	1.2	-0.1	167	0	23	0	6.3	0.1
AXF	55	0	55	1.1	0.6	54	0	54	0	8.1	-0.5
AZA	22	0	0	1.2	-0.4	23	0	9	0	6.6	-0.7
BAL	29	0	7	1.1	0.0	26	0	8	0	6.7	-1.1
CFC	61	2	3	0.9	0.1	55	0	5	0	9.1	1.4
CKS	59	0	17	1.7	0.0	37	0	22	0	8.0	-0.6
CRL	29	0	3	1.4	0.7	31	0	3	0	6.9	0.4
DAL	171	1	40	1.5	0.4	155	0	43	0	6.2	0.4
DLH	284	0	13	1.6	-0.1	283	0	18	0	10.6	1.3
EIA	42	0	100	1.9	0.5	38	0	100	0	19.9	4.3
FDX	729	0	26	1.1	0.3	580	0	27	0	6.8	0.0
FOM	20	0	35	1.5	0.1	20	10	40	0	5.5	-1.1
GAF	58	5	9	1.8	0.2	25	0	12	0	11.9	0.3
GCO	37	0	16	0.8	0.2	37	0	16	0	7.6	2.5
GHA	22	0	9	0.8	0.2	23	0	13	0	15.5	-1.7
GNY	20	0	5	2.3	1.7	20	0	0	0	6.3	2.4
HAL	188	0	44	1.3	-0.1	188	0	43	0	5.1	0.0
ICE	66	0	14	1.2	-0.6	38	0	24	0	9.7	0.3
JAL	71	0	4	1.4	0.6	74	0	3	0	7.2	1.0
JAZ	36	0	6	1.5	1.0	37	0	5	0	5.7	-0.5
KAL	68	3	10	1.9	-0.9	67	1	12	0	9.7	-0.6
KIW	28	7	43	2.9	2.3	27	0	48	0	6.9	2.1
KLM	32	0	3	1.1	0.3	23	0	4	0	8.5	3.1
LAN	49	2	16	1.5	0.7	46	0	15	0	7.3	1.2
MAS	31	0	16	0.8	0.2	31	0	16	0	5.1	0.3
MPH	65	2	3	1.3	-0.6	49	0	2	0	5.8	0.5
NCA	68	1	3	1.6	0.0	53	0	4	0	8.1	-0.7
NWA	360	0	8	1.6	0.2	345	0	9	0	8.9	-0.7
NZL	18575	0	53	1.0	0.2	18574	0	53	0	4.6	0.0
OAE	32	0	31	1.8	-0.2	31	0	90	0	11.2	1.6
PAC	66	0	9	1.8	0.2	56	0	14	0	9.3	1.2
PAL	35	6	31	1.3	-0.5	34	0	29	0	9.1	2.3
QFA	228	0	37	1.1	0.1	229	1	37	0	5.1	-0.2
RCH	38	3	100	2.7	1.2	27	0	100	0	10.7	1.2
RRR	167	1	12	2.2	0.9	173	1	18	0	11.4	0.0
SIA	55	0	0	1.1	0.6	55	0	0	0	5.6	0.5
SVH	3434	0	58	1.6	0.6	3434	0	58	0	4.2	0.4
UAE	70	0	0	1.1	0.6	70	0	0	0	5.7	0.2
UAL	331439	0	99	1.1	-0.1	331204	0	99	0	4.5	0.3
UPS	237	0	50	1.1	-0.1	239	0	50	0	10.5	-0.2
VVP	75	3	49	3.1	1.0	75	0	49	0	11.4	1.7
VVR	21	10	48	3.2	0.6	21	0	38	0	3.8	1.9
WOA	149	2	7	1.5	0.2	115	1	9	0	8.1	0.6

		TEMPERATURE				WIND					
IDENT.	N.REP.	PG	PR	RMS	BIAS	N.REP.	PG	PR	PC	RMS	BIAS
AU	30365	0	48	1.1	0.4	30508	0	48	0	4.1	0.1
EU	626925	0	68	1.0	0.2	622603	0	68	0	3.7	0.0
HK	3522	0	73	1.2	0.3	3522	0	73	0	4.3	0.4
KL	1199	0	55	2.1	1.2	1199	0	54	0	4.5	-0.3
MK	2726	0	50	1.2	0.5	2696	0	50	0	4.5	0.6
SA	3260	0	57	1.6	0.3	3260	0	57	0	4.3	0.0
N	55	35	44	2.7	1.0	38	0	39	0	19.4	6.9
US ACARS	1611477	0	77	1.1	0.3	1606963	0	77	0	4.3	0.2

Figure 3a. AIRCRAFT 300 - 150 hPa mean daily count. MAY 2004
Observations with O-B vector difference greater than 60 ms-1 excluded
Global average number of observations in 24 hours = 46859

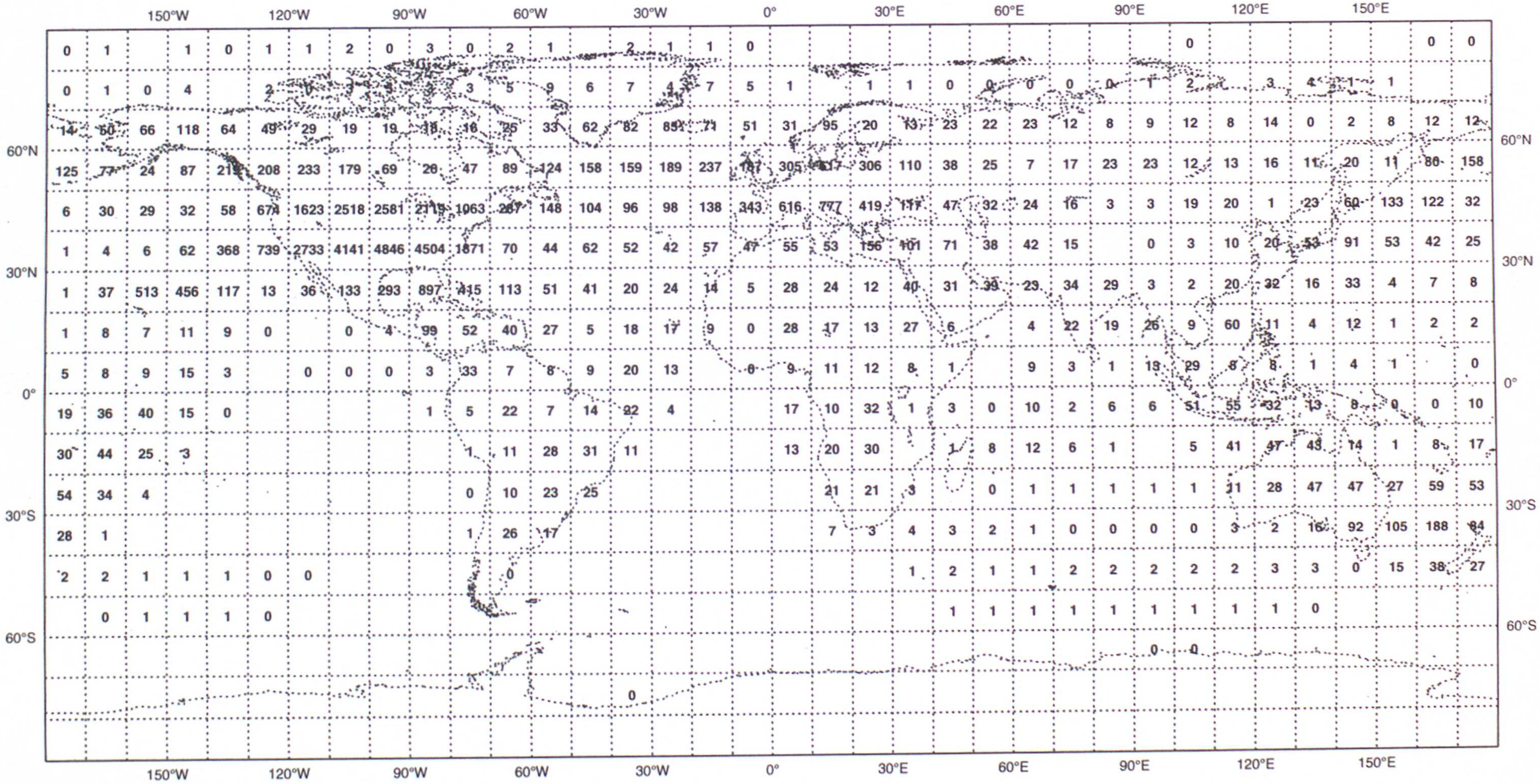

150°W 120°W 90°W 60°W 30°W 0° 30°E 60°E 90°E 120°E 150°E
60°N 30°N 0° 30°S 60°S
0 1 1 0 1 1 2 0 3 0 2 1 2 1 1 0 0 0 0
0 1 0 4 2 0 3 3 3 5 9 6 7 4 7 5 1 1 1 0 0 0 0 0 1 2 3 4 1 1
14 50 66 118 64 49 29 19 19 18 16 25 33 62 82 85 71 51 31 95 20 13 23 22 23 12 8 9 12 8 14 0 2 8 12 12
125 77 24 87 218 208 233 179 69 26 47 89 124 158 159 189 237 167 305 417 306 110 38 25 7 17 23 23 12 13 16 11 20 11 86 158
6 30 29 32 58 674 1623 2518 2581 2118 1063 267 148 104 96 98 138 343 616 777 419 117 47 32 24 16 3 3 19 20 1 23 60 133 122 32
1 4 6 62 368 739 2733 4141 4846 4504 1871 70 44 62 52 42 57 47 55 53 156 101 71 38 42 15 0 3 10 20 53 91 53 42 25
1 37 513 456 117 13 36 133 293 897 415 113 51 41 20 24 14 5 28 24 12 40 31 39 23 34 29 3 2 20 32 16 33 4 7 8
1 8 7 11 9 0 0 4 99 52 40 27 5 18 17 9 0 28 17 13 27 6 4 22 19 26 9 60 11 4 12 1 2 2
5 8 9 15 3 0 0 0 3 33 7 8 9 20 13 8 9 11 12 8 1 9 3 1 13 29 8 8 1 4 1 0
19 36 40 15 0 1 5 22 7 14 22 4 17 10 32 1 3 0 10 2 6 6 51 55 32 13 8 0 0 10
30 44 25 3 1 11 28 31 11 13 20 30 1 8 12 6 1 5 41 47 43 14 1 8 17
54 34 4 0 10 23 25 21 21 3 0 1 1 1 1 1 11 28 47 47 27 59 53
28 1 1 26 17 7 3 4 3 2 1 0 0 0 0 3 2 16 92 105 188 84
2 2 1 1 1 0 0 0 1 2 1 1 2 2 2 2 2 3 3 0 15 38 27
0 1 1 1 0 1 1 1 1 1 1 1 1 1 0
0 0
0
150°W 120°W 90°W 60°W 30°W 0° 30°E 60°E 90°E 120°E 150°E

Figure 3b. AIRCRAFT 1000 - 301 hPa mean daily count. MAY 2004
Observations with O-B vector difference greater than 60 ms-1 excluded
Global average number of observations in 24 hours = 84783

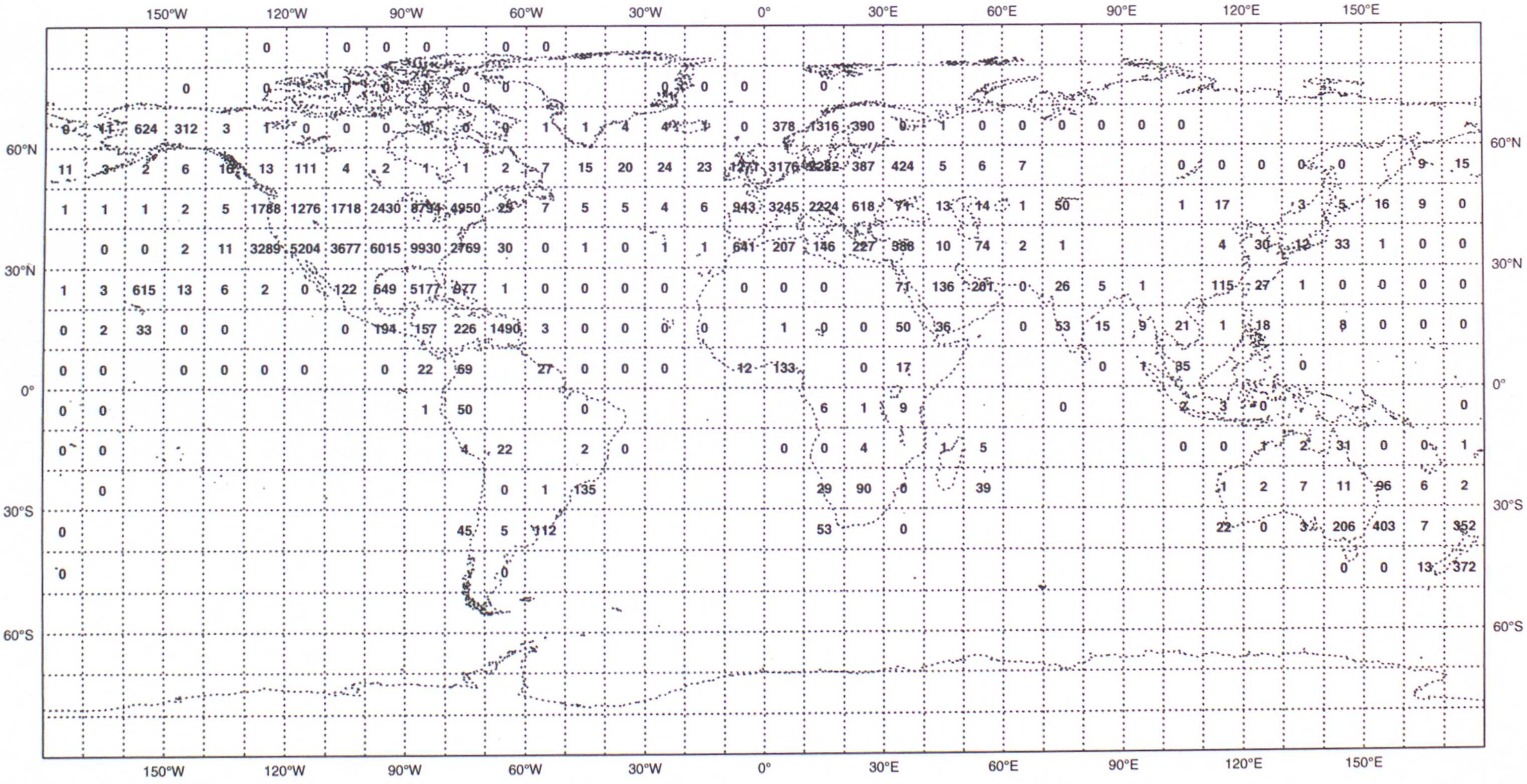

150°W
120°W
90°W
60°W
30°W
0°
30°E
60°E
90°E
120°E
150°E
60°N
30°N
0°
30°S
60°S
0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 11 624 312 3 1 0 0 0 0 0 0 1 1 4 4 1 0 378 1316 390 0 1 0 0 0 0 0 0
11 3 2 6 18 13 111 4 2 1 1 2 7 15 20 24 23 1271 3176 3282 387 424 5 6 7 0 0 0 0 0 9 15
1 1 1 2 5 1788 1276 1718 2430 8794 4950 25 7 5 5 4 6 943 3245 2224 618 71 13 14 1 50 1 17 3 5 16 9 0
0 0 2 11 3289 5204 3677 6015 9930 2769 30 0 1 0 1 1 641 207 146 227 388 10 74 2 1 4 30 12 33 1 0 0
1 3 615 13 6 2 0 122 649 5177 977 1 0 0 0 0 0 0 0 71 136 201 0 26 5 1 115 27 1 0 0 0 0
0 2 33 0 0 0 194 157 226 1490 3 0 0 0 0 1 0 0 50 36 0 53 15 9 21 1 18 8 0 0 0
0 0 0 0 0 0 0 22 69 27 0 0 0 12 133 0 17 0 1 35 0
0 0 1 50 0 6 1 9 0 2 3 0 0
0 0 4 22 2 0 0 0 4 1 5 0 0 1 2 31 0 0 1
0 0 1 135 29 90 0 39 1 2 7 11 96 6 2
0 45 5 112 53 0 22 0 3 206 403 7 352
0 0 0 0 13 372

Figure 4a. AIRCRAFT 300 - 150 hPa mean winds. MAY 2004
Observations with O-B vector difference greater than 60 ms-1 excluded
Arrows are plotted where greater than 30 obs are present

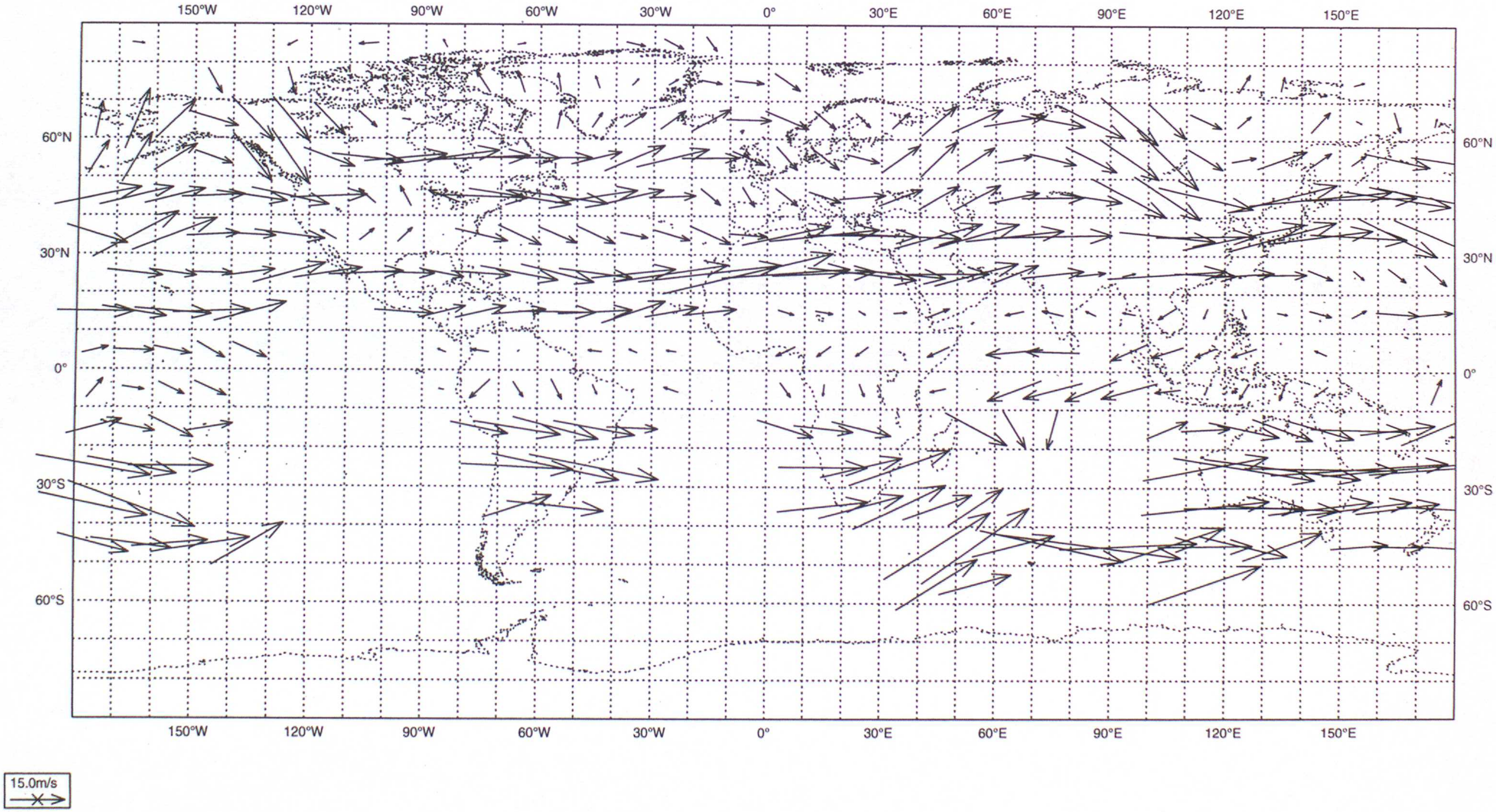

150°W
120°W
90°W
60°W
30°W
0°
30°E
60°E
90°E
120°E
150°E
60°N
30°N
0°
30°S
60°S
15.0m/s

Figure 4b. AIRCRAFT 1000 - 301 hPa mean winds. MAY 2004
Observations with O-B vector difference greater than 60 ms-1 excluded
Arrows are plotted where greater than 30 obs are present

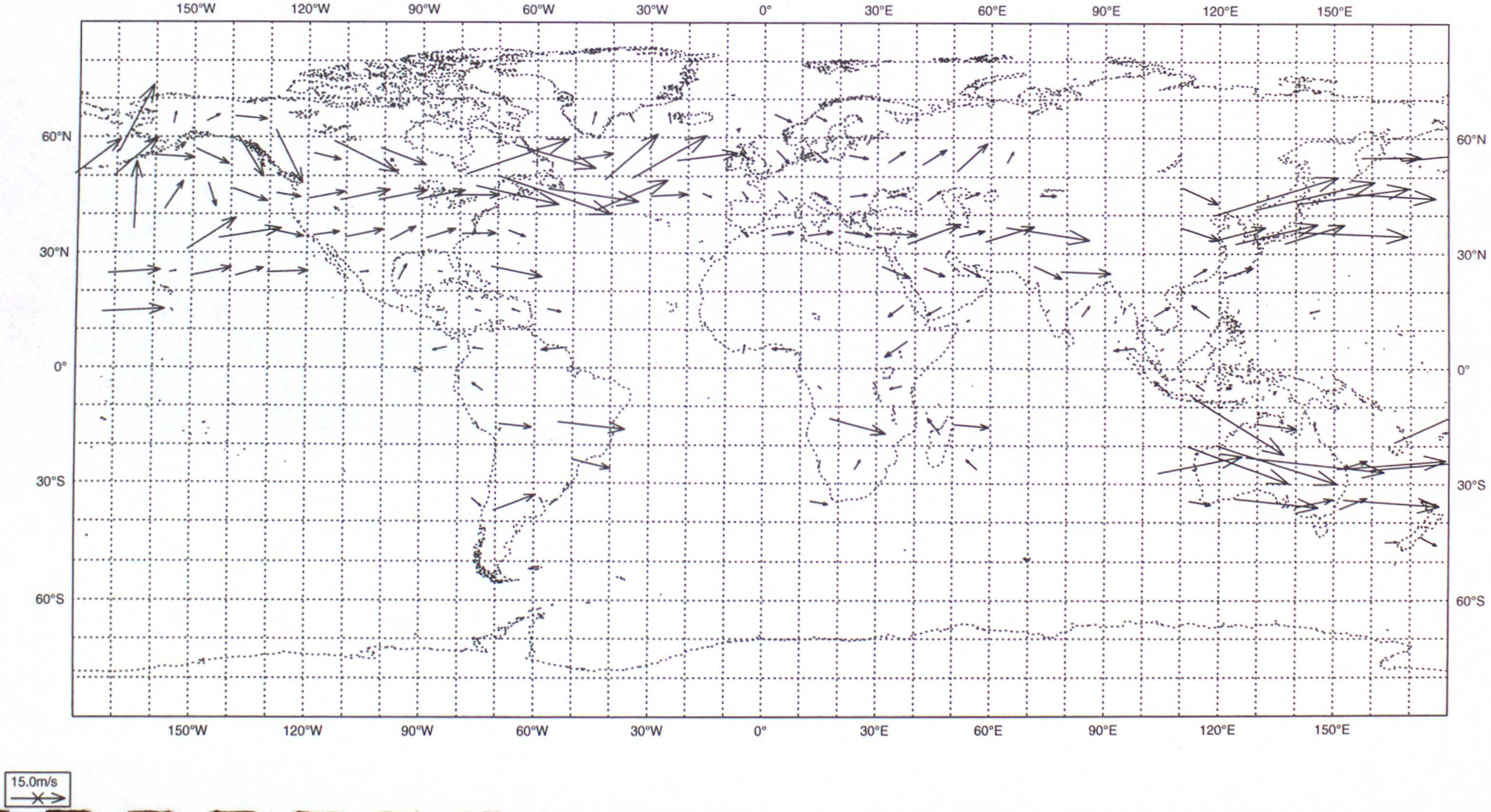

150°W
120°W
90°W
60°W
30°W
0°
30°E
60°E
90°E
120°E
150°E
60°N
30°N
0°
30°S
60°S
15.0m/s

Figure 5a. AIRCRAFT 300 - 150 hPa mean O-B winds. MAY 2004
Observations with O-B vector difference greater than 60 ms-1 excluded
Arrows are plotted where greater than 30 obs are present

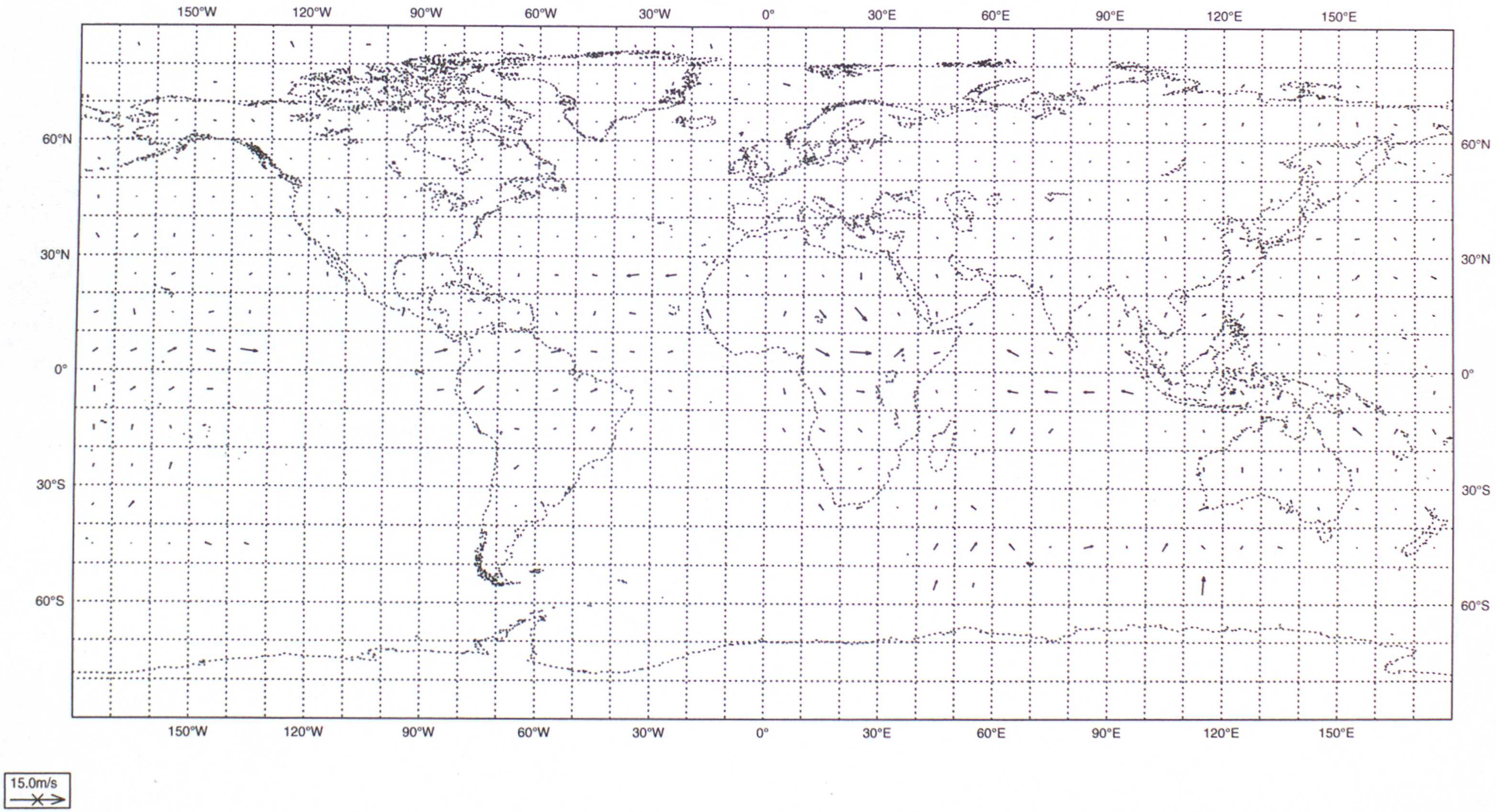

150°W
120°W
90°W
60°W
30°W
0°
30°E
60°E
90°E
120°E
150°E
60°N
30°N
0°
30°S
60°S
15.0m/s

Figure 5b. AIRCRAFT 1000 - 301 hPa mean O-B winds. MAY 2004
Observations with O-B vector difference greater than 60 ms-1 excluded
Arrows are plotted where greater than 30 obs are present

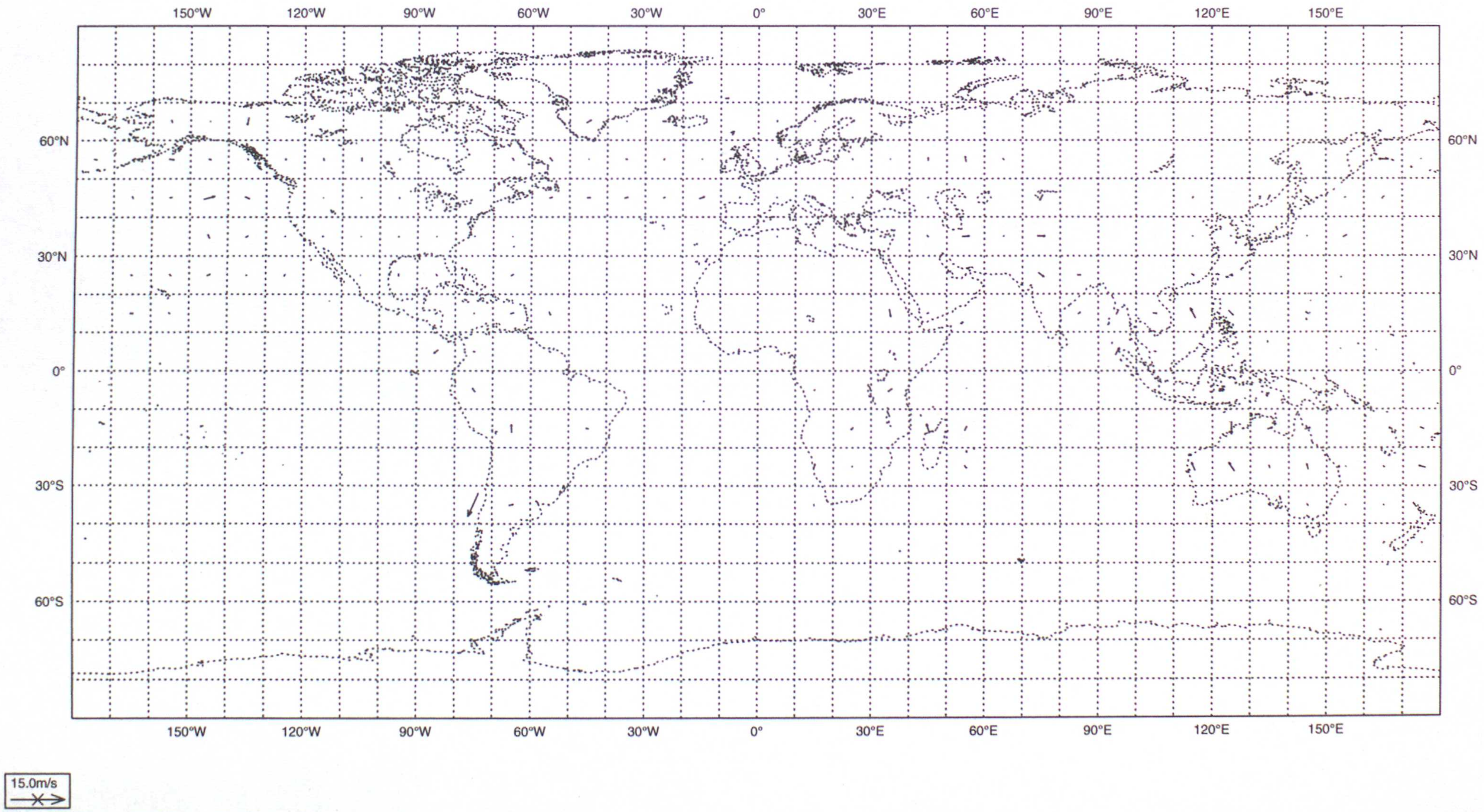
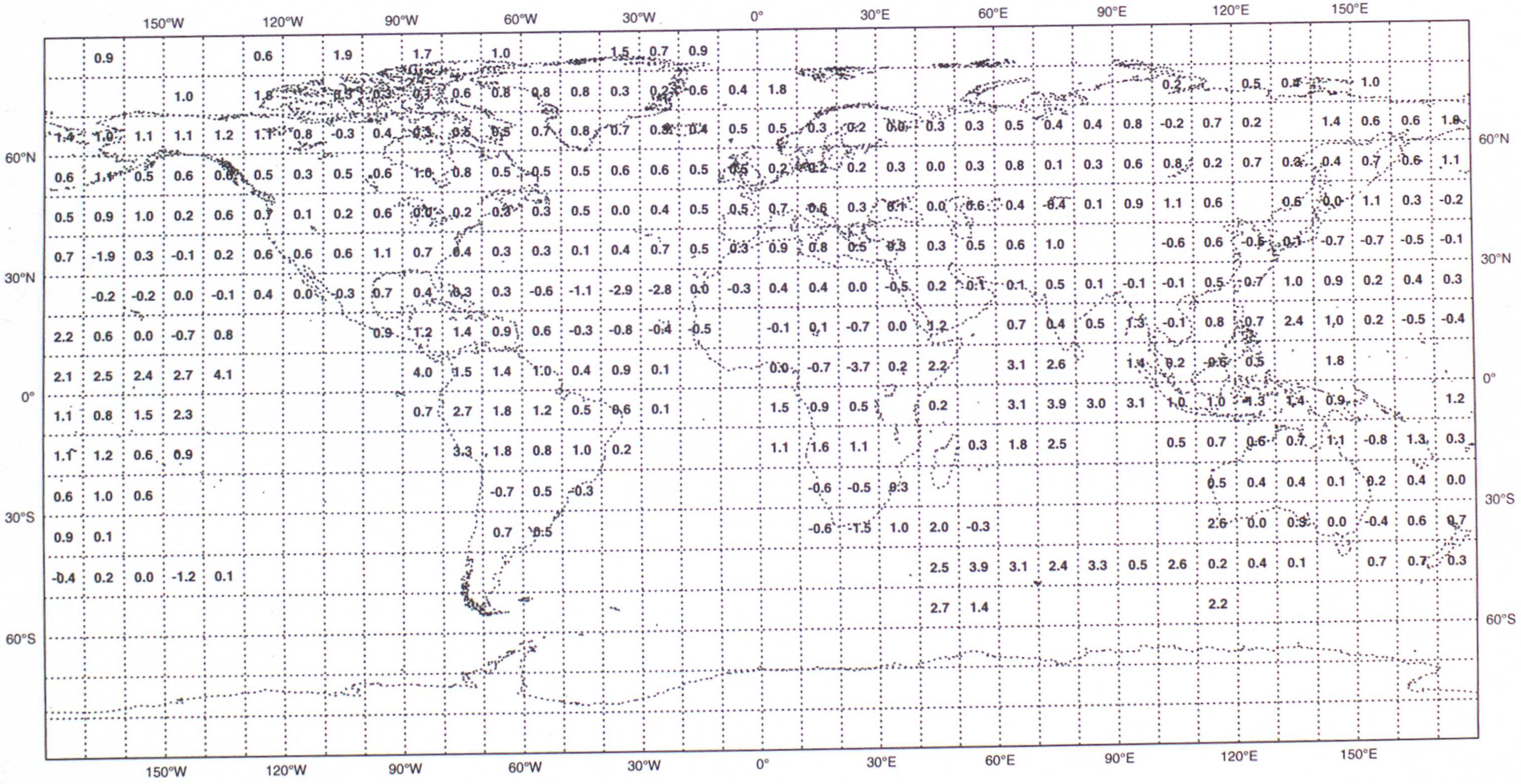

150°W
120°W
90°W
60°W
30°W
0°
30°E
60°E
90°E
120°E
150°E
60°N
30°N
0°
30°S
60°S
15.0m/s

Figure 6a. AIRCRAFT 300 - 150 hPa mean O-B speeds (ms-1). MAY 2004
Observations with O-B vector difference greater than 60 ms-1 excluded
Values are printed where greater than 30 obs are present



150°W
120°W
90°W
60°W
30°W
0°
30°E
60°E
90°E
120°E
150°E
60°N
30°N
0°
30°S
60°S

Figure 6b. AIRCRAFT 1000 - 301 hPa mean O-B speeds (ms-1). MAY 2004
Observations with O-B vector difference greater than 60 ms-1 excluded
Values are printed where greater than 30 obs are present

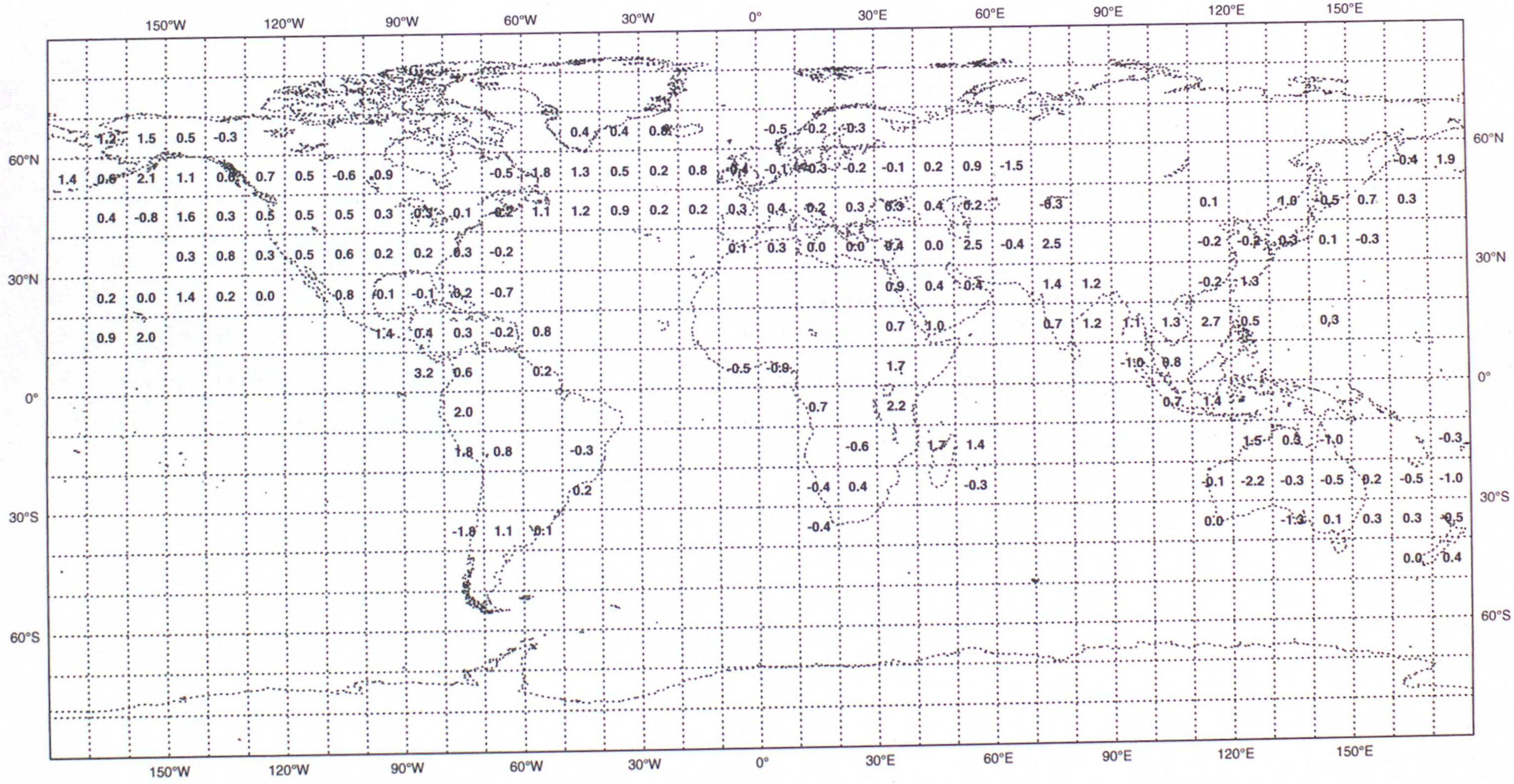

150°W
120°W
90°W
60°W
30°W
0°
30°E
60°E
90°E
120°E
150°E
60°N
30°N
0°
30°S
60°S
1.2 1.5 0.5 -0.3 0.4 0.4 0.8 -0.5 -0.2 -0.3
1.4 0.6 2.1 1.1 0.6 0.7 0.5 -0.6 0.9 -0.5 -1.8 1.3 0.5 0.2 0.8 -0.4 -0.1 -0.3 -0.2 -0.1 0.2 0.9 -1.5 -0.4 1.9
0.4 -0.8 1.6 0.3 0.5 0.5 0.5 0.3 0.3 0.1 -0.2 1.1 1.2 0.9 0.2 0.2 0.3 0.4 0.2 0.3 0.3 0.4 0.2 -0.3 0.1 1.0 -0.5 0.7 0.3
0.3 0.8 0.3 0.5 0.6 0.2 0.2 0.3 -0.2 0.1 0.3 0.0 0.0 0.4 0.0 2.5 -0.4 2.5 -0.2 -0.2 0.3 0.1 -0.3
0.2 0.0 1.4 0.2 0.0 -0.8 0.1 -0.1 0.2 -0.7 0.9 0.4 0.4 1.4 1.2 -0.2 1.3
0.9 2.0 1.4 0.4 0.3 -0.2 0.8 0.7 1.0 0.7 1.2 1.1 1.3 2.7 0.5 0,3
3.2 0.6 0.2 -0.5 -0.9 1.7 -1.0 0.8
2.0 0.7 2.2 0.7 1.4
1.8 0.8 -0.3 -0.6 1.7 1.4 1.5 0.3 1.0 -0.3
0.2 -0.4 0.4 -0.3 0.1 -2.2 -0.3 -0.5 0.2 -0.5 -1.0
-1.8 1.1 0.1 -0.4 0.0 -1.3 0.1 0.3 0.3 0.5
0.0 0.4

Figure 7a. AIRCRAFT 300 - 150 hPa RMS O-B vector (ms-1). MAY 2004
Observations with O-B vector difference greater than 60 ms-1 excluded
Values are printed where greater than 30 obs are present

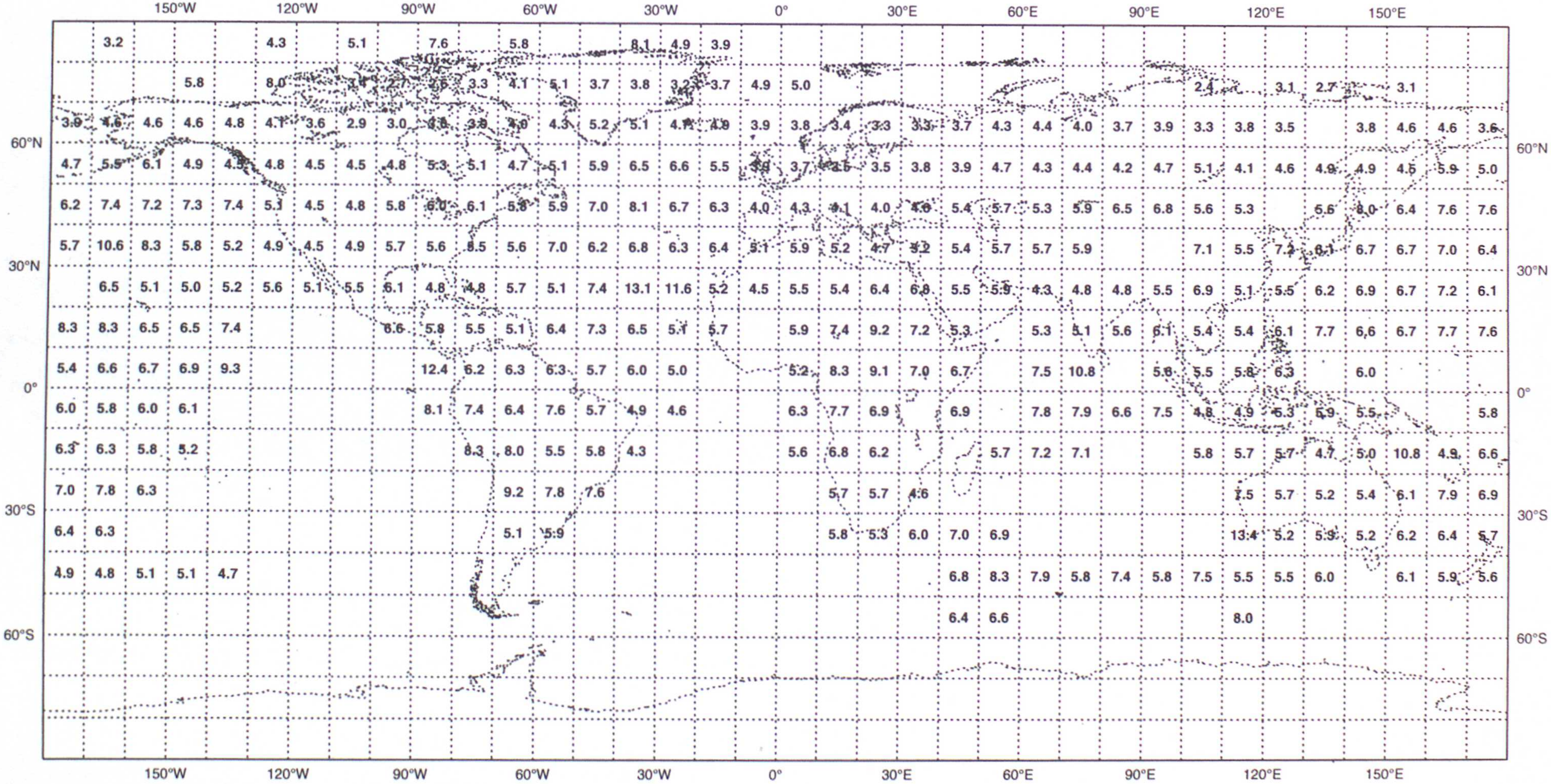

150°W 120°W 90°W 60°W 30°W 0° 30°E 60°E 90°E 120°E 150°E
60°N
30°N
0°
30°S
60°S
3.2 4.3 5.1 7.6 5.8 8.1 4.9 3.9
5.8 8.0 3.4 2.7 2.6 3.3 4.1 5.1 3.7 3.8 3.2 3.7 4.9 5.0 2.4 3.1 2.7 3.1
3.9 4.6 4.6 4.6 4.8 4.1 3.6 2.9 3.0 3.8 3.8 4.0 4.3 5.2 5.1 4.1 4.9 3.9 3.8 3.4 3.3 3.3 3.7 4.3 4.4 4.0 3.7 3.9 3.3 3.8 3.5 3.8 4.6 4.6 3.6
4.7 5.5 6.1 4.9 4.5 4.8 4.5 4.5 4.8 5.3 5.1 4.7 5.1 5.9 6.5 6.6 5.5 3.9 3.7 2.5 3.5 3.8 3.9 4.7 4.3 4.4 4.2 4.7 5.1 4.1 4.6 4.9 4.9 4.5 5.9 5.0
6.2 7.4 7.2 7.3 7.4 5.1 4.5 4.8 5.8 6.0 6.1 5.8 5.9 7.0 8.1 6.7 6.3 4.0 4.3 4.1 4.0 4.6 5.4 5.7 5.3 5.9 6.5 6.8 5.6 5.3 5.6 8.0 6.4 7.6 7.6
5.7 10.6 8.3 5.8 5.2 4.9 4.5 4.9 5.7 5.6 8.5 5.6 7.0 6.2 6.8 6.3 6.4 5.1 5.9 5.2 4.7 3.2 5.4 5.7 5.7 5.9 7.1 5.5 7.2 6.1 6.7 6.7 7.0 6.4
6.5 5.1 5.0 5.2 5.6 5.1 5.5 6.1 4.8 4.8 5.7 5.1 7.4 13.1 11.6 5.2 4.5 5.5 5.4 6.4 6.8 5.5 5.9 4.3 4.8 4.8 5.5 6.9 5.1 5.5 6.2 6.9 6.7 7.2 6.1
8.3 8.3 6.5 6.5 7.4 6.6 5.8 5.5 5.1 6.4 7.3 6.5 5.1 5.7 5.9 7.4 9.2 7.2 5.3 5.3 5.1 5.6 6.1 5.4 5.4 6.1 7.7 6.6 6.7 7.7 7.6
5.4 6.6 6.7 6.9 9.3 12.4 6.2 6.3 6.3 5.7 6.0 5.0 5.2 8.3 9.1 7.0 6.7 7.5 10.8 5.6 5.5 5.8 6.3 6.0
6.0 5.8 6.0 6.1 8.1 7.4 6.4 7.6 5.7 4.9 4.6 6.3 7.7 6.9 6.9 7.8 7.9 6.6 7.5 4.8 4.9 5.3 5.9 5.5 5.8
6.3 6.3 5.8 5.2 8.3 8.0 5.5 5.8 4.3 5.6 6.8 6.2 5.7 7.2 7.1 5.8 5.7 5.7 4.7 5.0 10.8 4.9 6.6
7.0 7.8 6.3 9.2 7.8 7.6 5.7 5.7 4.6 7.5 5.7 5.2 5.4 6.1 7.9 6.9
6.4 6.3 5.1 5.9 5.8 5.3 6.0 7.0 6.9 13.4 5.2 5.9 5.2 6.2 6.4 5.7
4.9 4.8 5.1 5.1 4.7 6.8 8.3 7.9 5.8 7.4 5.8 7.5 5.5 5.5 6.0 6.1 5.9 5.6
6.4 6.6 8.0

Figure 7b. AIRCRAFT 1000 - 301 hPa RMS O-B vector (ms-1). MAY 2004
Observations with O-B vector difference greater than 60 ms-1 excluded
Values are printed where greater than 30 obs are present

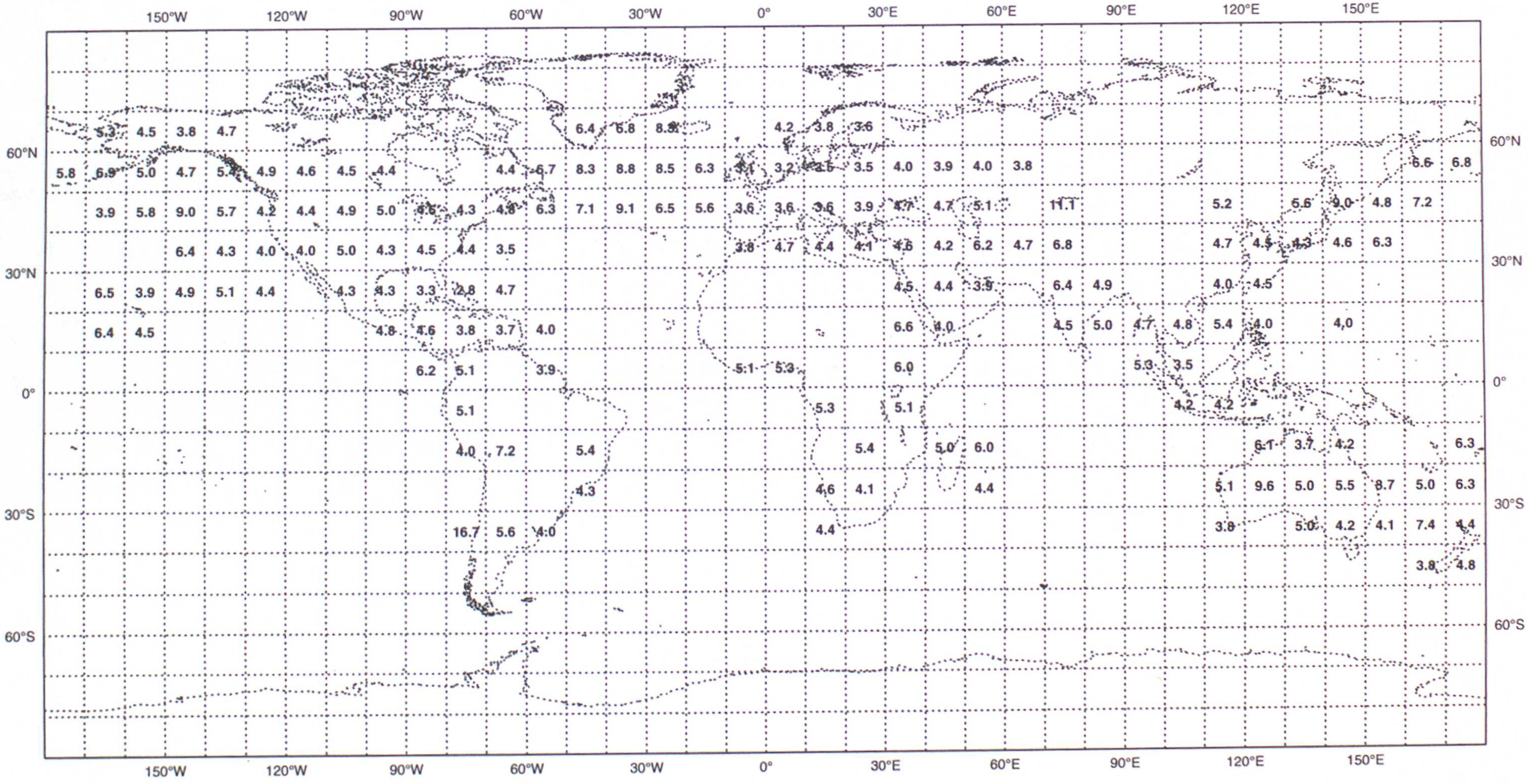

150°W
120°W
90°W
60°W
30°W
0°
30°E
60°E
90°E
120°E
150°E
60°N
30°N
0°
30°S
60°S
5.3 4.5 3.8 4.7 6.4 6.8 8.8 4.2 3.8 3.6
5.8 6.9 5.0 4.7 5.4 4.9 4.6 4.5 4.4 4.4 6.7 8.3 8.8 8.5 6.3 3.1 3.2 3.5 3.5 4.0 3.9 4.0 3.8 6.6 6.8
3.9 5.8 9.0 5.7 4.2 4.4 4.9 5.0 4.6 4.3 4.8 6.3 7.1 9.1 6.5 5.6 3.6 3.6 3.6 3.9 4.7 4.7 5.1 11.1 5.2 5.6 9.0 4.8 7.2
6.4 4.3 4.0 4.0 5.0 4.3 4.5 4.4 3.5 3.8 4.7 4.4 4.1 4.6 4.2 6.2 4.7 6.8 4.7 4.5 4.3 4.6 6.3
6.5 3.9 4.9 5.1 4.4 4.3 4.3 3.3 2.8 4.7 4.5 4.4 3.9 6.4 4.9 4.0 4.5
6.4 4.5 4.8 4.6 3.8 3.7 4.0 6.6 4.0 4.5 5.0 4.7 4.8 5.4 4.0 4,0
6.2 5.1 3.9 5.1 5.3 6.0 5.3 3.5
5.1 5.3 5.1 4.2 4.2
4.0 7.2 5.4 5.4 5.0 6.0 6.1 3.7 4.2 6.3
4.3 4.6 4.1 4.4 5.1 9.6 5.0 5.5 8.7 5.0 6.3
16.7 5.6 4.0 4.4 3.8 5.0 4.2 4.1 7.4 4.4
3.8 4.8

TABLE 5

MONTHLY MONITORING OF RADIOSONDE OBSERVATIONS
MONITORING CENTRE: EXETER
MONTH: May 2004

Monitoring procedures

Period		:One calendar month.
Data monitored		:Reports from each unique identifier for radiosonde TEMPs.
Area monitored		:90°N - 90°S, 180°W - 180°E.
Standard of comparison		:Background field from UKMO global model.
Observation times		:00 UTC and 12 UTC.
Level(s) monitored		:Standard levels between 1000.0 - 30.0 hPa
Element monitored		:GEOPOTENTIAL HEIGHT IN metres
Parameters monitored	:NUM OBS	:Number of observations available at level shown during period.
	:NUM GROSS	:Number of gross errors at level shown during period.
	:% REJ	:Percentage of observations rejected by quality control at level shown during period excluding those with gross errors.
	:SD	:SD of difference of observations from background values at level shown excluding those with gross errors.
	:BIAS	:Mean difference of observations from background values at level shown excluding those with gross errors.
	:RMS	:Root Mean Square difference of observations from background values at level shown excluding those with gross errors.
	:NUM LEVELS	:Number of levels satisfying selection criteria.
GROSS ERROR LIMITS	:Defined in Appendix I.1	
SELECTION CRITERIA	: ≥3 levels with ≥10 observations and ≥ 100 m weighted RMS.	

ONLY THE WORST LEVEL IS SHOWN WITH UNWEIGHTED RMS

WMO IDENT	OBS TIME	ELM	LEV	LAT/LONG	NUM OBS	NUM GROSS	SD	BIAS	RMS	NUM LEVELS
34247	12	Z	1000	50/ 41	26	4	27.8	-42.8	51.0	6
34880	12	Z	100	46/ 48	12	0	29.2	106.6	110.5	4
42101	00	Z	200	30/ 76	12	0	74.4	-67.8	100.7	7
42101	12	Z	70	30/ 76	9	1	113.1	149.3	187.3	6
42182	00	Z	100	29/ 77	19	0	142.1	81.9	164.0	9
42182	12	Z	850	29/ 77	28	1	26.9	40.0	48.2	7
42314	00	Z	100	27/ 95	12	0	135.9	-55.0	146.7	5
42314	12	Z	200	27/ 95	12	0	55.9	-79.3	97.0	4
42339	00	Z	150	26/ 73	13	1	98.1	50.8	110.5	8
42339	12	Z	150	26/ 73	14	0	111.7	42.7	119.6	5
42361	00	Z	300	26/ 78	12	1	81.1	-20.7	83.7	4
42361	12	Z	200	26/ 78	8	2	116.0	0.3	116.0	7
42369	00	Z	1000	27/ 81	10	15	13.1	-86.7	87.7	9
42369	12	Z	1000	27/ 81	2	24	5.0	-85.0	85.1	9
42379	00	Z	250	27/ 83	11	0	38.8	-117.3	123.5	6
42379	12	Z	1000	27/ 83	23	1	32.6	-38.2	50.2	4
42410	00	Z	70	26/ 92	13	0	103.7	163.7	193.8	7
42647	00	Z	200	23/ 73	10	0	113.5	22.0	115.6	6
42647	12	Z	1000	23/ 73	20	0	21.2	-49.0	53.4	5
42701	00	Z	100	23/ 85	11	3	143.6	78.5	163.7	6
42701	12	Z	150	23/ 85	13	2	81.7	50.0	95.8	4
42724	12	Z	200	24/ 91	18	0	105.8	-40.1	113.1	8
42809	00	Z	50	23/ 88	14	0	121.0	149.8	192.5	6
42809	12	Z	1000	23/ 88	29	1	23.7	-28.4	37.0	5
42867	00	Z	250	21/ 79	14	0	95.8	-0.6	95.8	8
42867	12	Z	400	21/ 79	17	0	69.0	9.8	69.7	7
42874	00	Z	300	21/ 82	20	0	76.0	9.1	76.6	4
42971	00	Z	70	20/ 86	8	2	97.6	179.2	204.1	7
42971	12	Z	1000	20/ 86	21	6	21.7	-49.6	54.2	6
43003	00	Z	1000	19/ 73	16	14	11.2	-86.1	86.8	4
43003	12	Z	1000	19/ 73	8	22	7.4	-88.6	88.9	10
43014	12	Z	150	20/ 75	9	1	89.7	102.8	136.4	4
43128	00	Z	850	17/ 78	30	1	26.3	35.6	44.2	10
43128	12	Z	150	17/ 78	22	2	105.1	115.8	156.4	12
43185	00	Z	200	16/ 81	17	0	100.9	51.6	113.3	11
43185	12	Z	150	16/ 81	12	2	117.4	39.2	123.7	11
43192	12	Z	100	15/ 74	9	1	159.6	130.4	206.1	7
43279	00	Z	1000	13/ 80	26	0	24.4	-35.5	43.1	5
43279	12	Z	1000	13/ 80	27	0	19.6	-57.3	60.6	11
43295	12	Z	150	13/ 78	15	1	106.6	-41.4	114.4	7
43333	12	Z	200	12/ 93	24	0	56.8	-62.1	84.2	4
43346	00	Z	850	11/ 80	20	0	31.6	19.4	37.1	5
43346	12	Z	200	11/ 80	10	0	99.6	77.4	126.2	5
43353	00	Z	1000	10/ 76	16	9	5.9	-90.8	91.0	5
43371	00	Z	400	8/ 77	25	0	48.1	-55.6	73.5	11
43371	12	Z	30	8/ 77	12	0	214.1	10.8	214.4	6
57083	00	Z	1000	35/ 114	13	17	20.6	-73.8	76.6	4
58968	00	Z	1000	25/ 122	15	15	10.0	-87.9	88.5	4
71124	12	Z	400	54/-114	16	0	38.3	-51.3	64.0	4
78073	12	Z	200	25/ -77	16	1	77.2	-38.3	86.2	5
84378	12	Z	1000	-4/ -73	10	0	11.1	40.9	42.4	4
92044	00	Z	70	-2/ 147	5	0	197.1	-100.0	221.0	4
97180	00	Z	200	-5/ 120	10	0	57.8	-92.5	109.1	5

Figure 8. TEMP 500 hPa geopotential mean daily count. MAY 2004
All hours
Global average number of observations in 24 hours = 1151

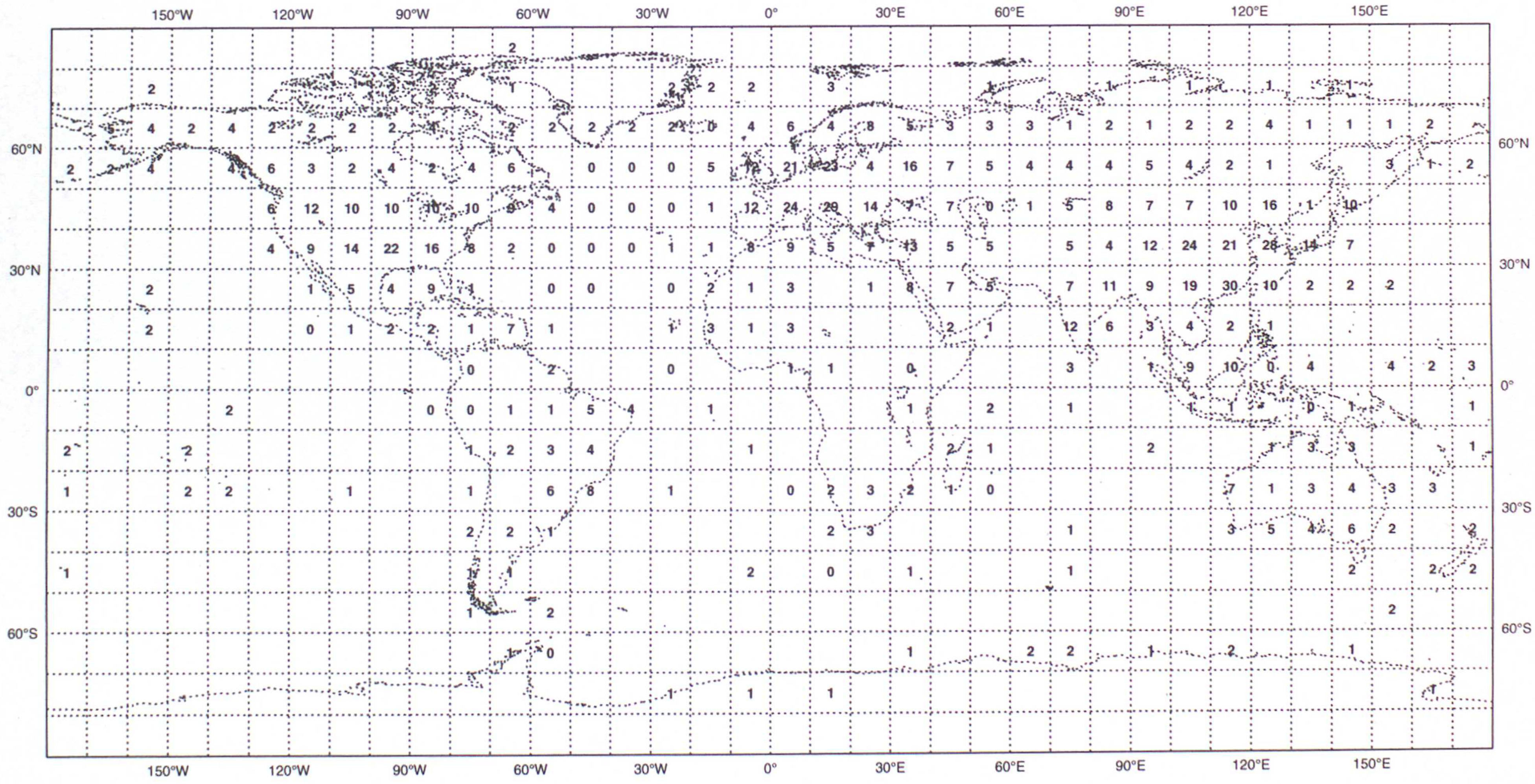

150°W
120°W
90°W
60°W
30°W
0°
30°E
60°E
90°E
120°E
150°E
60°N
30°N
0°
30°S
60°S

TABLE 6

MONTHLY MONITORING OF RADIOSONDE OBSERVATIONS
MONITORING CENTRE: EXETER
MONTH: May 2004

Monitoring procedures

Period		:One calendar month.
Data monitored		:Reports from each unique identifier for radiosonde TEMPs.
Area monitored		:90°N - 90°S, 180°W - 180°E.
Standard of comparison		:Background field from UKMO global model.
Observation times		:00 UTC and 12 UTC.
Level(s) monitored		:Standard levels between 1000.0 - 100.0 hPa
Element monitored		:VECTOR WIND in m s^{-1}
Parameters monitored	:NUM OBS	:Number of observations available at level shown during period.
	:NUM GROSS	:Number of gross errors at level shown during period.
	:% REJ	:Percentage of observations rejected by quality control at level shown during period excluding those with gross errors.
	:UBIAS,VBIAS	:Mean difference of observations of U and V components from background values at level shown excluding those with gross errors.
	:RMS	:Root Mean Square difference of observations from background values at level shown excluding those with gross errors.
	:NUM LEVELS	:Number of levels satisfying selection criteria.
GROSS ERROR LIMITS	:Defined in Appendix I.2	
SELECTION CRITERIA	: $\geq$ 10 observations and $\geq$ 15 m s^{-1} RMS vector wind.	

ONLY THE STANDARD LEVEL BETWEEN 1000 - 100 hPa WITH HIGHEST RMS IS SHOWN

```
 WMO   OBS                              NUM    NUM     %
IDENT TIME ELM  LEV     LAT/LONG   OBS   GROSS  REJ   UBIAS    VBIAS     RMS     LEVELS


42410  00   V   150     26/  92     12      0   100     4.0     12.5     19.1       2
43285  12   V   150     13/  75     12      0     8     4.4      2.9     20.3       1
47058  00   V   400     39/ 126     12      0   100     0.5      2.5     15.1       1
48565  00   V   100      8/  98     18      0    50    15.3      2.4     23.3       2
54135  12   V   300     44/ 122     29      0     6    -2.6      1.2     15.3       1

60360  12   V   150     37/   8     14      0   100     9.1      0.3     19.3       1
60566  12   V   400     32/   4     10      0   100   -11.2     -3.4     16.4       1
60571  00   V   150     31/  -2     22      0     4    -3.8      1.0     21.6       1
60656  12   V   250     28/  -8     16      0     6    -3.6     -2.8     18.1       1
61995  12   V   200    -20/  58     13      0     7    -2.7      0.2     15.2       1

62306  12   V   200     31/  27     21      0     4    -8.1     -2.0     19.7       4
62337  00   V   150     31/  34     17      0   100    -7.7      9.4     15.0       1
62378  12   V   150     30/  31     29      0   100   -18.7     -0.3     22.4       4
68174  12   V   150    -24/  29     11      0   100     1.8     -3.0     18.6       2
68263  12   V   300    -26/  28     17      0    47    -4.8      4.4     18.8       1

68442  12   V   250    -29/  26     12      1   100    -8.4     -1.0     26.7       1
68588  12   V   200    -30/  31     14      3    28     4.2      9.0     18.0       1
76458  12   V   200     23/-106     23      0     4    -1.9      2.3     17.8       1
78866  12   V   100     18/ -63     12      0   100     3.6      1.1     15.1       1
```

Figure 9. TEMP/PILOT 300 hPa wind mean daily count. MAY 2004
All hours
Global average number of observations in 24 hours = 1299

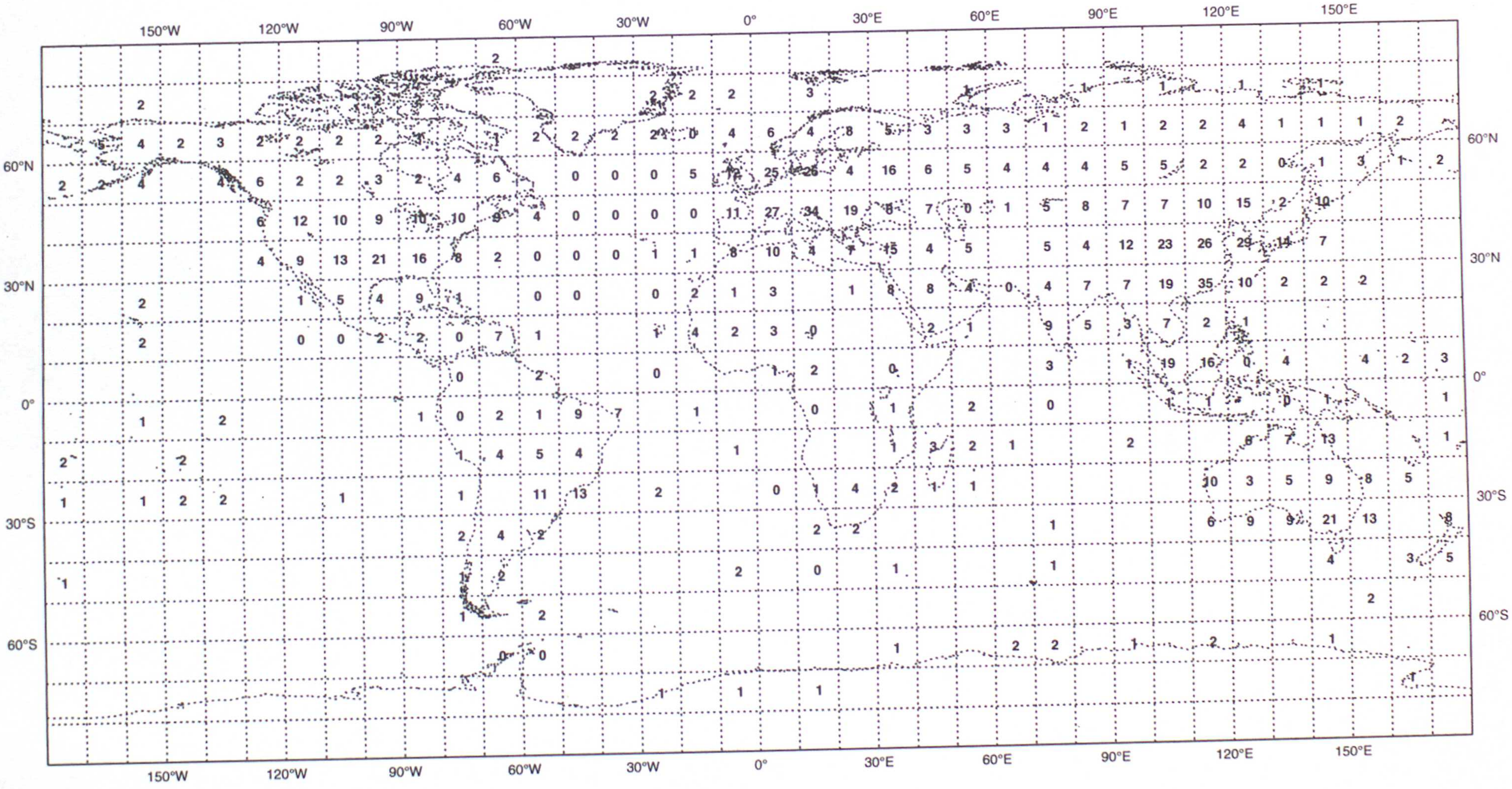

150°W
120°W
90°W
60°W
30°W
0°
30°E
60°E
90°E
120°E
150°E
60°N
30°N
0°
30°S
60°S

TABLE 7

MONTHLY MONITORING OF RADIOSONDE OBSERVATIONS
MONITORING CENTRE: EXETER
MONTH: May 2004

Monitoring procedures

Period		:One calendar month.
Data monitored		:Reports from each unique identifier for radiosonde TEMPs.
Area monitored		:90°N - 90°S, 180°W - 180°E.
Standard of comparison		:Background field from UKMO global model.
Observation times		:00 UTC and 12 UTC.
Level(s) monitored		:Standard levels between 500.0 - 150.0 hPa
Element monitored		:WIND DIRECTION in degrees
Parameters monitored		
	:NUM OBS	:Average number of observations at all levels.
	:BIAS	:Mean difference of observations from background values from all levels.
	:MAX SPREAD	:(For observation - background values) Maximum absolute difference of SD at any level from SD at all levels
	:SD	:SD of difference of observations from background values at all levels.

SELECTION CRITERIA :NUM OBS ≥ 5, and
ABSOLUTE BIAS ≥ 10°, with
SD < 30°, and
MAX SPREAD < 10°

WMO IDENT	OBS TIME	ELM	LAT/LONG	NUM OBS	BIAS	MAX SPREAD	SD
08594	12	DD	17/ -23	25	-11.4	8.7	16.0
33791	12	DD	48/ 33	27	-10.6	5.2	11.8
42182	00	DD	29/ 77	23	12.2	6.2	16.6
42182	12	DD	29/ 77	26	13.5	4.5	15.6
42379	00	DD	27/ 83	11	17.3	5.2	17.4
43279	00	DD	13/ 80	13	-16.4	6.7	26.9
43285	00	DD	13/ 75	10	-10.0	3.2	22.0
48568	12	DD	7/ 101	19	12.4	5.8	25.2
72786	00	DD	48/-118	23	22.2	3.0	12.8
72786	12	DD	48/-118	22	20.3	7.1	12.0
78954	12	DD	13/ -59	22	-15.9	4.5	14.9

MONITORING OF SATELLITE WINDS

MONITORING CENTRE: EXETER

MONTH: May 2004

Monitoring procedures

Period :One calendar month.

Data monitored :Reports from GOES-9, GOES-10, GOES-12, METEOSAT-5, METEOSAT-7

Standard of comparison :Background field from UKMO global model.

Selection Criteria :number of observations > 10.

Data Extracted :Layer 701 - 1000 hPa
401 - 700 hPa
101 - 400 hPa

:Mean wind

:Mean observation minus background vector wind differences

:Mean observation minus background speed differences

:RMS of observation minus background vector differences

Figure 10. SATOB 701 - 1000 hPa mean daily count. MAY 2004
Global average number of observations in 24 hours = 81738

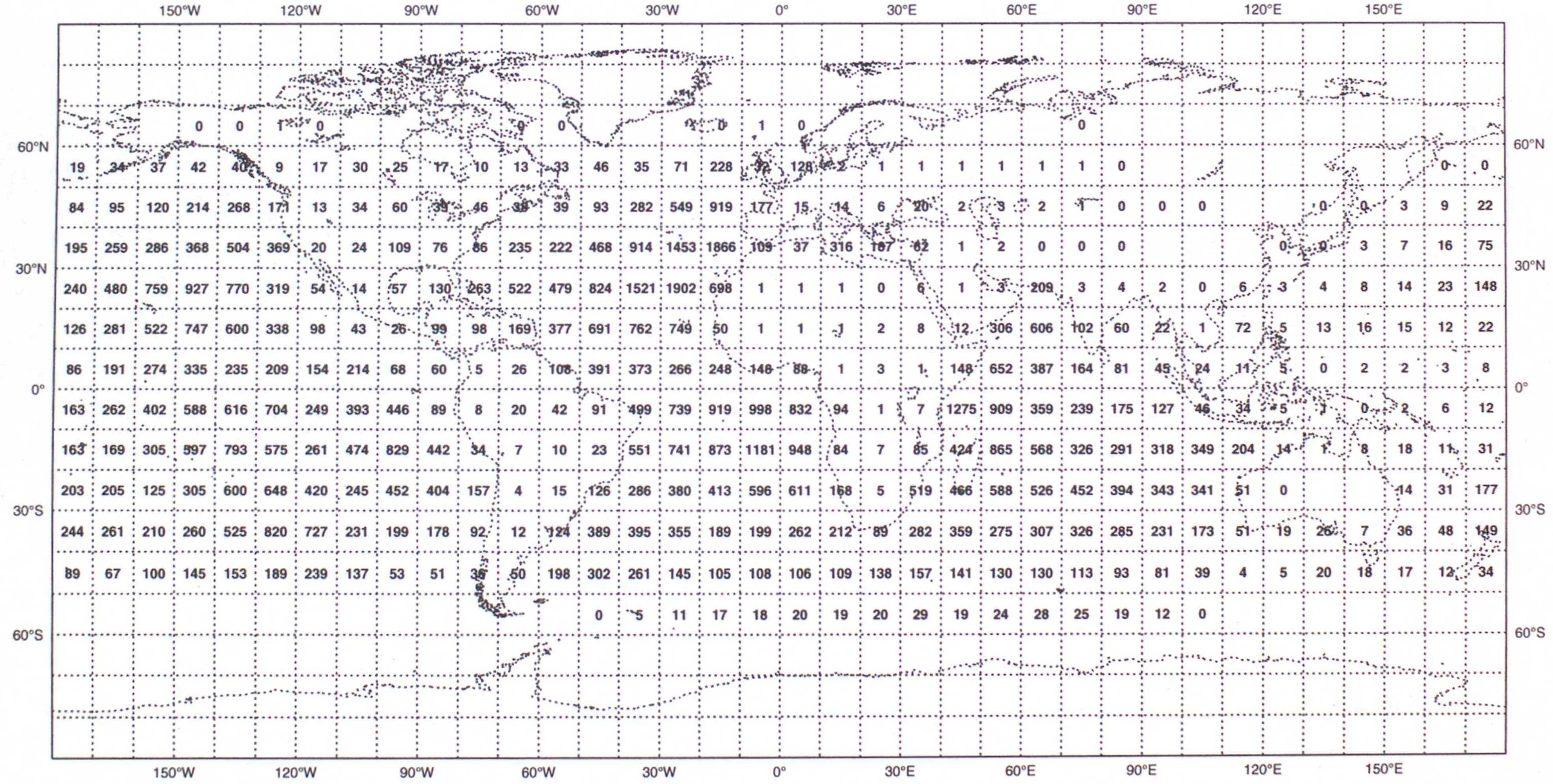

150°W
120°W
90°W
60°W
30°W
0°
30°E
60°E
90°E
120°E
150°E
60°N
30°N
0°
30°S
60°S
0 0 1 0 0 0 0 1 0 0
19 34 37 42 40 9 17 30 25 17 10 13 33 46 35 71 228 72 128 2 1 1 1 1 1 1 0 0 0
84 95 120 214 268 171 13 34 60 39 46 38 39 93 282 549 919 177 15 14 6 20 2 3 2 1 0 0 0 0 0 3 9 22
195 259 286 368 504 369 20 24 109 76 86 235 222 468 914 1453 1866 109 37 316 187 62 1 2 0 0 0 0 0 3 7 16 75
240 480 759 927 770 319 54 14 57 130 263 522 479 824 1521 1902 698 1 1 1 0 6 1 3 209 3 4 2 0 6 3 4 8 14 23 148
126 281 522 747 600 338 98 43 26 99 98 169 377 691 762 749 50 1 1 1 2 8 12 306 606 102 60 22 1 72 5 13 16 15 12 22
86 191 274 335 235 209 154 214 68 60 5 26 108 391 373 266 248 148 88 1 3 1 148 652 387 164 81 45 24 11 5 0 2 2 3 8
163 262 402 588 616 704 249 393 446 89 8 20 42 91 499 739 919 998 832 94 1 7 1275 909 359 239 175 127 46 34 5 1 0 2 6 12
163 169 305 597 793 575 261 474 829 442 34 7 10 23 551 741 873 1181 948 84 7 85 424 865 568 326 291 318 349 204 14 1 8 18 11 31
203 205 125 305 600 648 420 245 452 404 157 4 15 126 286 380 413 596 611 168 5 519 466 588 526 452 394 343 341 51 0 14 31 177
244 261 210 260 525 820 727 231 199 178 92 12 124 389 395 355 189 199 262 212 89 282 359 275 307 326 285 231 173 51 19 26 7 36 48 149
89 67 100 145 153 189 239 137 53 51 36 50 198 302 261 145 105 108 106 109 138 157 141 130 130 113 93 81 39 4 5 20 18 17 12 34
0 5 11 17 18 20 19 20 29 19 24 28 25 19 12 0
150°W
120°W
90°W
60°W
30°W
0°
30°E
60°E
90°E
120°E
150°E
60°N
30°N
0°
30°S
60°S

Figure 11. SATOB 701 - 1000 hPa vector mean wind. MAY 2004
All observations
Arrows are plotted where greater than 10 obs are present

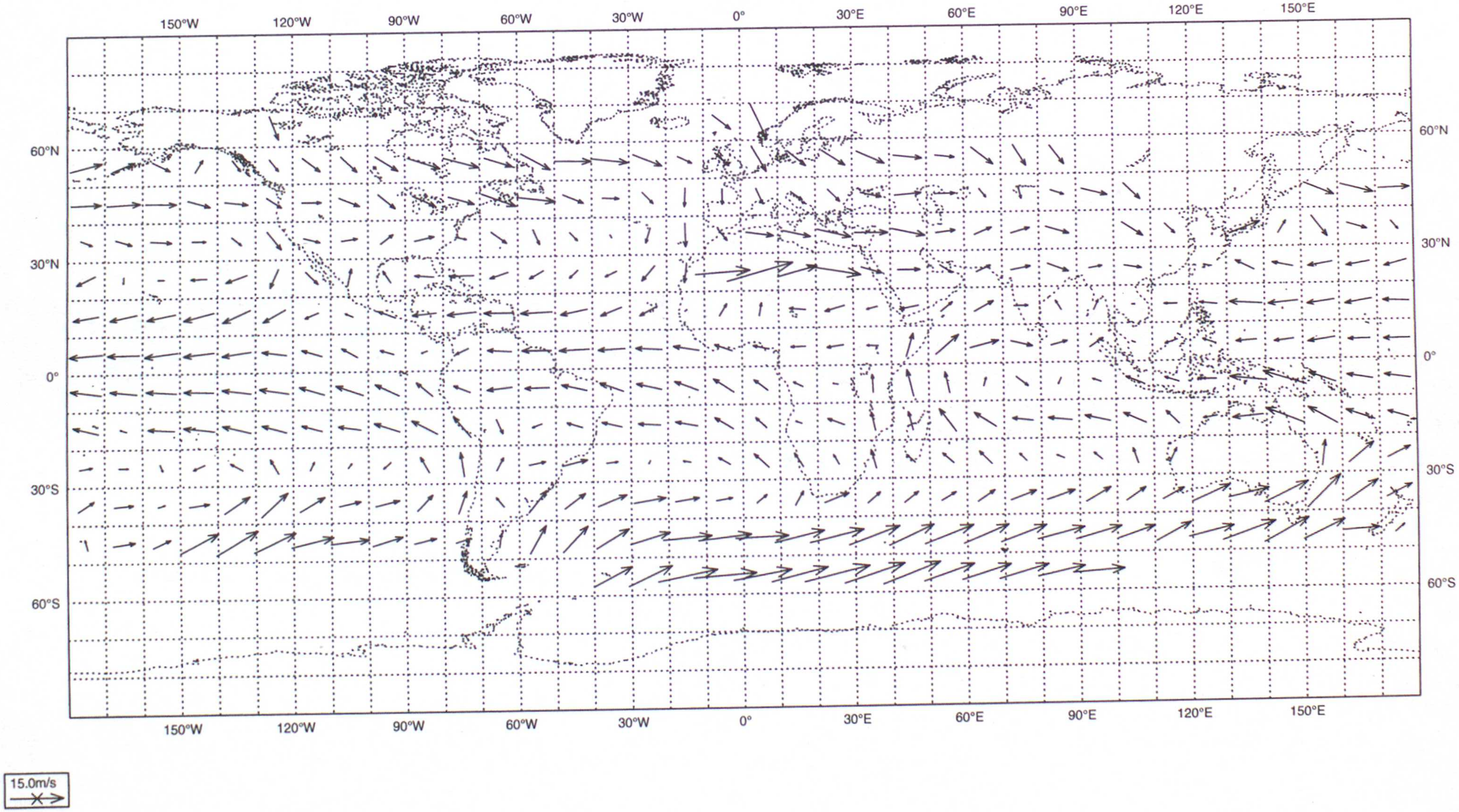

150°W
120°W
90°W
60°W
30°W
0°
30°E
60°E
90°E
120°E
150°E
60°N
30°N
0°
30°S
60°S
15.0m/s

Figure 12. SATOB 701 - 1000 hPa mean vector wind differences. MAY 2004
All observations
Arrows are plotted where greater than 10 obs are present

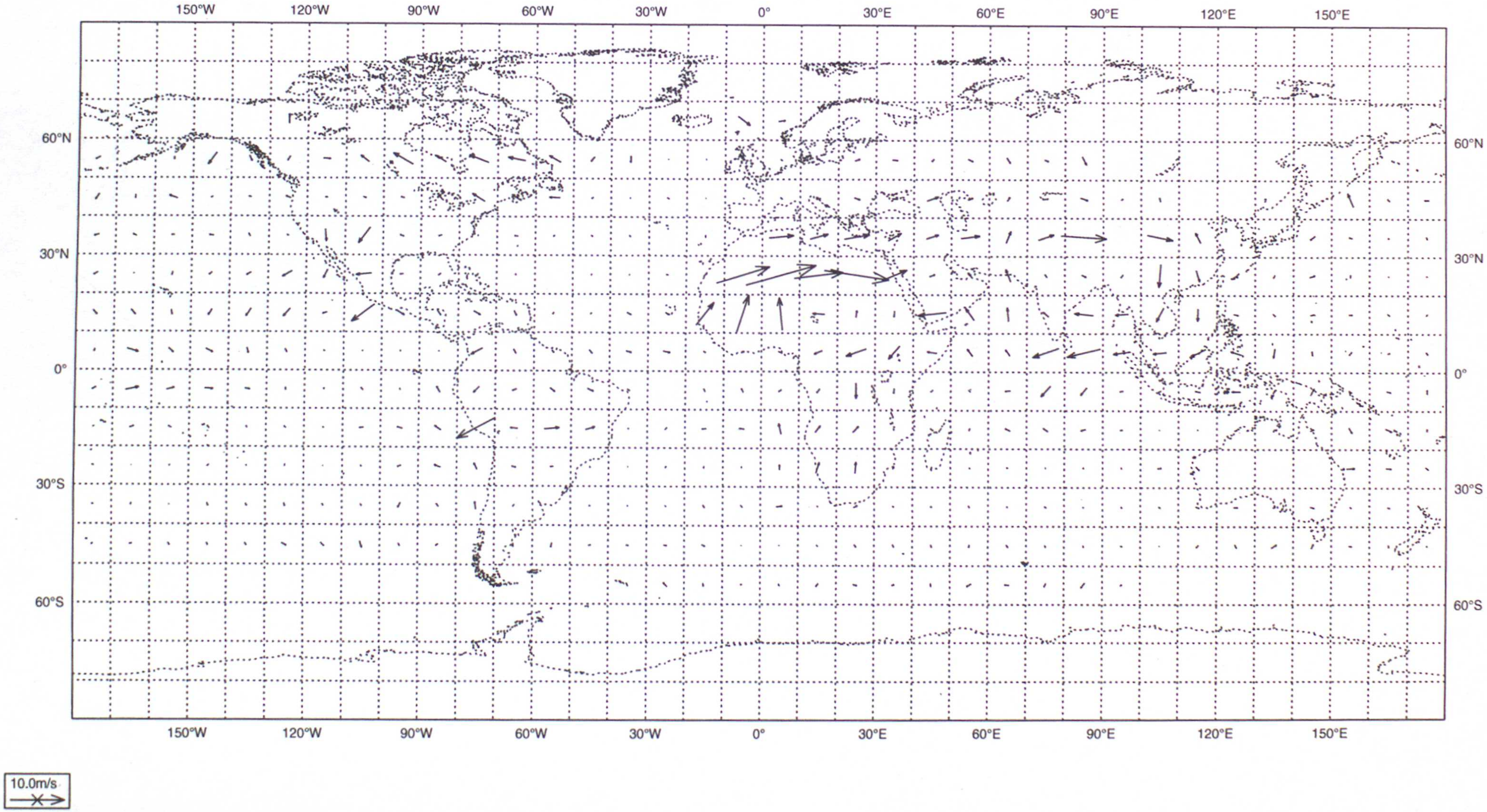

150°W
120°W
90°W
60°W
30°W
0°
30°E
60°E
90°E
120°E
150°E
60°N
30°N
0°
30°S
60°S
10.0m/s

Figure 13. SATOB 701 - 1000 hPa mean O-B speed differences (ms-1). MAY 2004
All observations
Values are plotted where greater than 10 obs are present

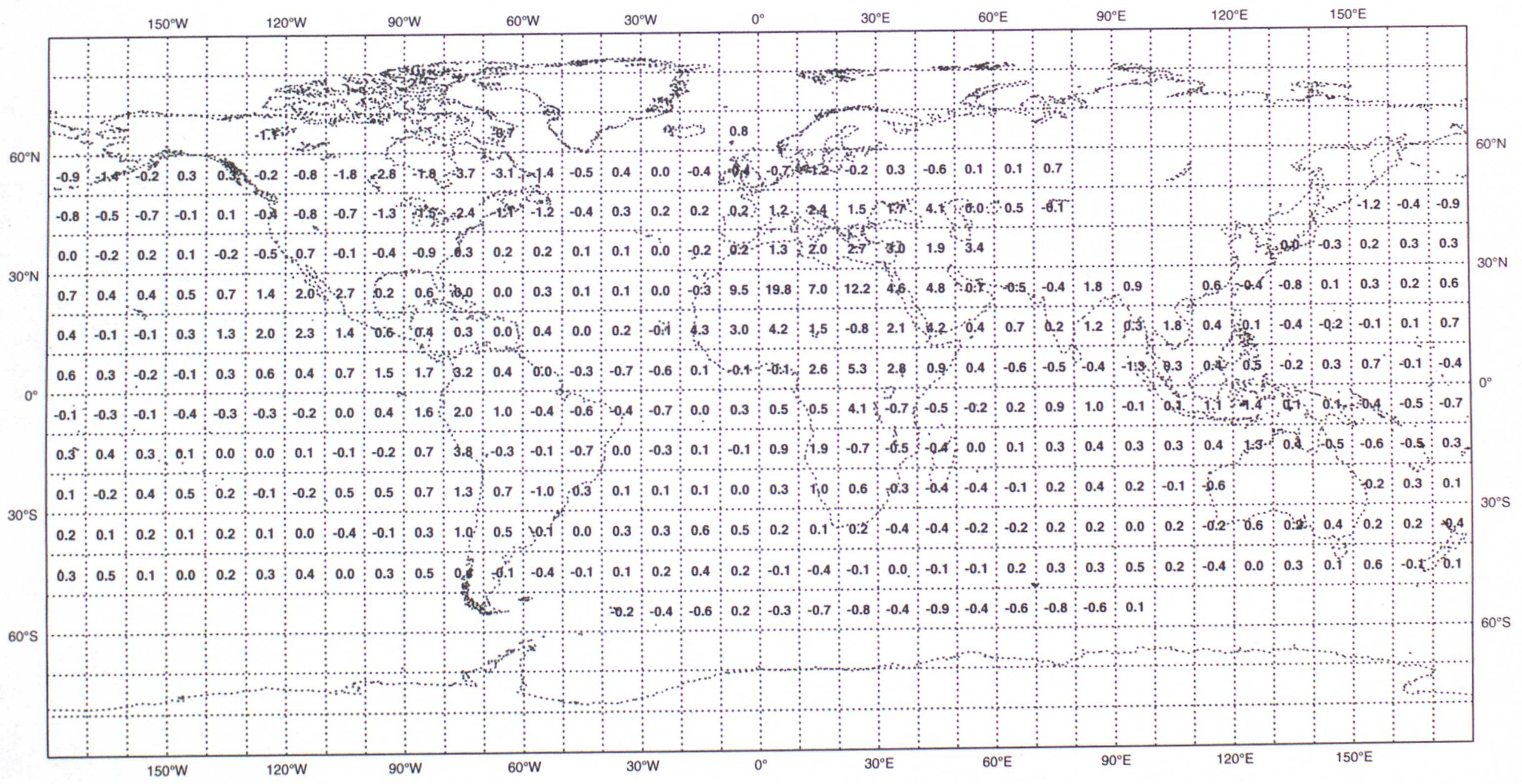

150°W
120°W
90°W
60°W
30°W
0°
30°E
60°E
90°E
120°E
150°E
60°N
30°N
0°
30°S
60°S
-1.1 0.7 0.8
-0.9 -1.4 -0.2 0.3 0.3 -0.2 -0.8 -1.8 -2.8 -1.8 -3.7 -3.1 -1.4 -0.5 0.4 0.0 -0.4 -0.4 -0.7 -1.2 -0.2 0.3 -0.6 0.1 0.1 0.7
-0.8 -0.5 -0.7 -0.1 0.1 -0.4 -0.8 -0.7 -1.3 -1.5 -2.4 -1.1 -1.2 -0.4 0.3 0.2 0.2 0.2 1.2 2.4 1.5 1.7 4.1 6.0 0.5 -6.1 -1.2 -0.4 -0.9
0.0 -0.2 0.2 0.1 -0.2 -0.5 0.7 -0.1 -0.4 -0.9 6.3 0.2 0.2 0.1 0.1 0.0 -0.2 0.2 1.3 2.0 2.7 3.0 1.9 3.4 0.0 -0.3 0.2 0.3 0.3
0.7 0.4 0.4 0.5 0.7 1.4 2.0 2.7 0.2 0.6 8.0 0.0 0.3 0.1 0.1 0.0 -0.3 9.5 19.8 7.0 12.2 4.6 4.8 0.7 -0.5 -0.4 1.8 0.9 0.6 -0.4 -0.8 0.1 0.3 0.2 0.6
0.4 -0.1 -0.1 0.3 1.3 2.0 2.3 1.4 0.6 0.4 0.3 0.0 0.4 0.0 0.2 -0.1 4.3 3.0 4.2 1.5 -0.8 2.1 4.2 0.4 0.7 0.2 1.2 0.3 1.8 0.4 0.1 -0.4 -0.2 -0.1 0.1 0.7
0.6 0.3 -0.2 -0.1 0.3 0.6 0.4 0.7 1.5 1.7 3.2 0.4 0.0 -0.3 -0.7 -0.6 0.1 -0.1 -0.1 2.6 5.3 2.8 0.9 0.4 -0.6 -0.5 -0.4 -1.3 0.3 0.4 0.5 -0.2 0.3 0.7 -0.1 -0.4
-0.1 -0.3 -0.1 -0.4 -0.3 -0.3 -0.2 0.0 0.4 1.6 2.0 1.0 -0.4 -0.6 -0.4 -0.7 0.0 0.3 0.5 0.5 4.1 -0.7 -0.5 -0.2 0.2 0.9 1.0 -0.1 0.1 1.1 -1.4 0.1 0.1 -0.4 -0.5 -0.7
0.3 0.4 0.3 0.1 0.0 0.0 0.1 -0.1 -0.2 0.7 3.8 -0.3 -0.1 -0.7 0.0 -0.3 0.1 -0.1 0.9 1.9 -0.7 -0.5 -0.4 0.0 0.1 0.3 0.4 0.3 0.3 0.4 1.3 0.4 -0.5 -0.6 -0.5 0.3
0.1 -0.2 0.4 0.5 0.2 -0.1 -0.2 0.5 0.5 0.7 1.3 0.7 -1.0 0.3 0.1 0.1 0.1 0.0 0.3 1.0 0.6 -0.3 -0.4 -0.4 -0.1 0.2 0.4 0.2 -0.1 -0.6 -0.2 0.3 0.1
0.2 0.1 0.2 0.1 0.2 0.1 0.0 -0.4 -0.1 0.3 1.0 0.5 0.1 0.0 0.3 0.3 0.6 0.5 0.2 0.1 0.2 -0.4 -0.4 -0.2 -0.2 0.2 0.2 0.0 0.2 -0.2 0.6 0.2 0.4 0.2 0.2 -0.4
0.3 0.5 0.1 0.0 0.2 0.3 0.4 0.0 0.3 0.5 0.4 -0.1 -0.4 -0.1 0.1 0.2 0.4 0.2 -0.1 -0.4 -0.1 0.0 -0.1 -0.1 0.2 0.3 0.3 0.5 0.2 -0.4 0.0 0.3 0.1 0.6 -0.1 0.1
-0.2 -0.4 -0.6 0.2 -0.3 -0.7 -0.8 -0.4 -0.9 -0.4 -0.6 -0.8 -0.6 0.1

Figure 14. SATOB 701 - 1000 hPa mean RMS O-B vector differences (ms-1). MAY 2004
All observations
Values are plotted where greater than 10 obs are present

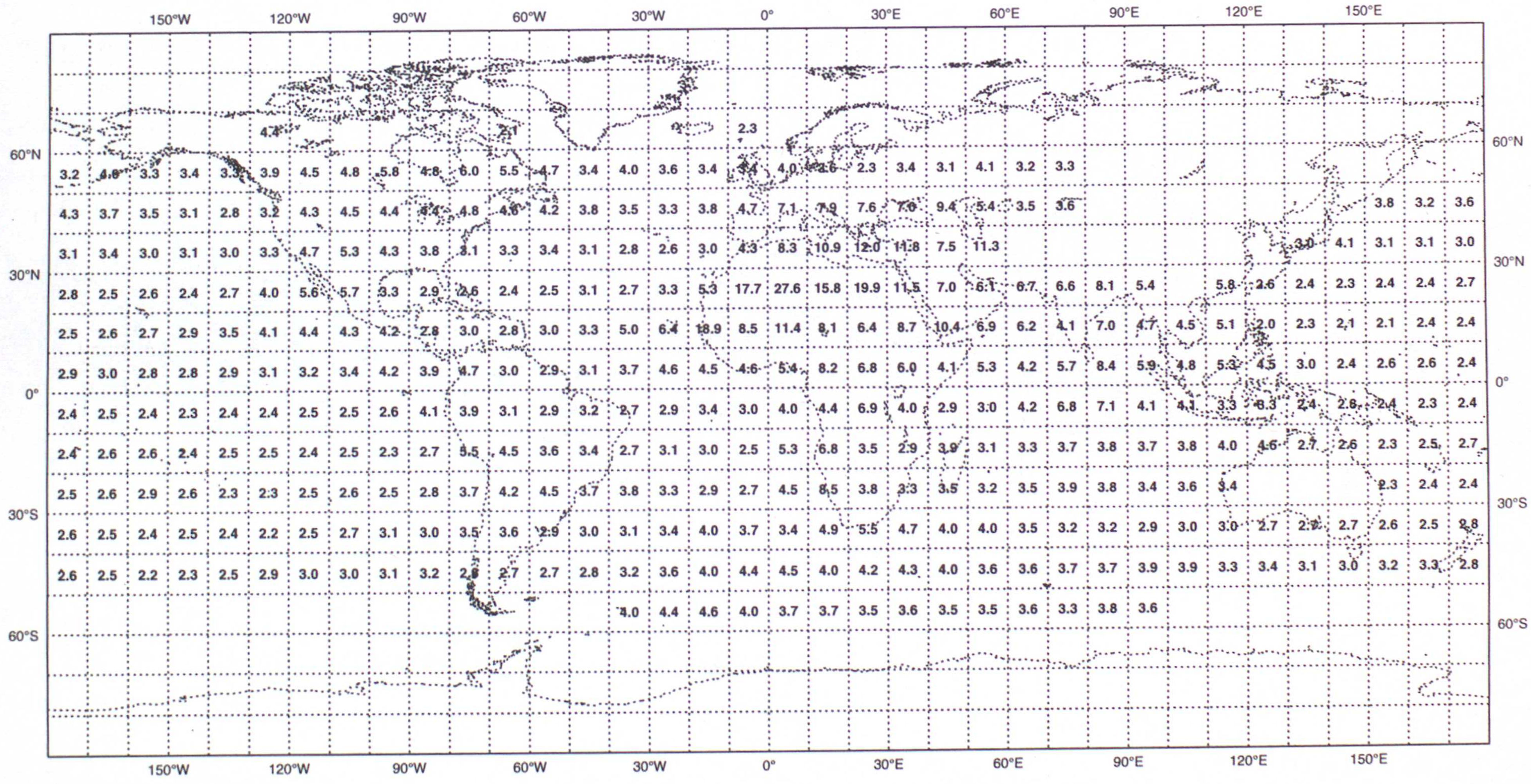

150°W 120°W 90°W 60°W 30°W 0° 30°E 60°E 90°E 120°E 150°E
60°N 30°N 0° 30°S 60°S
4.4 2.1 2.3
3.2 4.8 3.3 3.4 3.3 3.9 4.5 4.8 5.8 4.8 6.0 5.5 4.7 3.4 4.0 3.6 3.4 3.4 4.0 3.6 2.3 3.4 3.1 4.1 3.2 3.3
4.3 3.7 3.5 3.1 2.8 3.2 4.3 4.5 4.4 4.4 4.8 4.6 4.2 3.8 3.5 3.3 3.8 4.7 7.1 7.9 7.6 7.0 9.4 5.4 3.5 3.6 3.8 3.2 3.6
3.1 3.4 3.0 3.1 3.0 3.3 4.7 5.3 4.3 3.8 3.1 3.3 3.4 3.1 2.8 2.6 3.0 4.3 8.3 10.9 12.0 11.8 7.5 11.3 3.0 4.1 3.1 3.1 3.0
2.8 2.5 2.6 2.4 2.7 4.0 5.6 5.7 3.3 2.9 2.6 2.4 2.5 3.1 2.7 3.3 5.3 17.7 27.6 15.8 19.9 11.5 7.0 6.1 6.7 6.6 8.1 5.4 5.8 2.6 2.4 2.3 2.4 2.4 2.7
2.5 2.6 2.7 2.9 3.5 4.1 4.4 4.3 4.2 2.8 3.0 2.8 3.0 3.3 5.0 6.4 18.9 8.5 11.4 8.1 6.4 8.7 10.4 6.9 6.2 4.1 7.0 4.7 4.5 5.1 2.0 2.3 2.1 2.1 2.4 2.4
2.9 3.0 2.8 2.8 2.9 3.1 3.2 3.4 4.2 3.9 4.7 3.0 2.9 3.1 3.7 4.6 4.5 4.6 5.4 8.2 6.8 6.0 4.1 5.3 4.2 5.7 8.4 5.9 4.8 5.3 4.5 3.0 2.4 2.6 2.6 2.4
2.4 2.5 2.4 2.3 2.4 2.4 2.5 2.5 2.6 4.1 3.9 3.1 2.9 3.2 2.7 2.9 3.4 3.0 4.0 4.4 6.9 4.0 2.9 3.0 4.2 6.8 7.1 4.1 4.1 3.3 6.3 2.4 2.6 2.4 2.3 2.4
2.4 2.6 2.6 2.4 2.5 2.5 2.4 2.5 2.3 2.7 5.5 4.5 3.6 3.4 2.7 3.1 3.0 2.5 5.3 6.8 3.5 2.9 3.9 3.1 3.3 3.7 3.8 3.7 3.8 4.0 4.6 2.7 2.6 2.3 2.5 2.7
2.5 2.6 2.9 2.6 2.3 2.3 2.5 2.6 2.5 2.8 3.7 4.2 4.5 3.7 3.8 3.3 2.9 2.7 4.5 6.5 3.8 3.3 3.5 3.2 3.5 3.9 3.8 3.4 3.6 3.4 2.3 2.4 2.4
2.6 2.5 2.4 2.5 2.4 2.2 2.5 2.7 3.1 3.0 3.5 3.6 2.9 3.0 3.1 3.4 4.0 3.7 3.4 4.9 5.5 4.7 4.0 4.0 3.5 3.2 3.2 2.9 3.0 3.0 2.7 2.8 2.7 2.6 2.5 2.8
2.6 2.5 2.2 2.3 2.5 2.9 3.0 3.0 3.1 3.2 2.8 2.7 2.7 2.8 3.2 3.6 4.0 4.4 4.5 4.0 4.2 4.3 4.0 3.6 3.6 3.7 3.7 3.9 3.9 3.3 3.4 3.1 3.0 3.2 3.3 2.8
4.0 4.4 4.6 4.0 3.7 3.7 3.5 3.6 3.5 3.5 3.6 3.3 3.8 3.6

Figure 15. SATOB 401 - 700 hPa mean daily count. MAY 2004
Global average number of observations in 24 hours = 15509

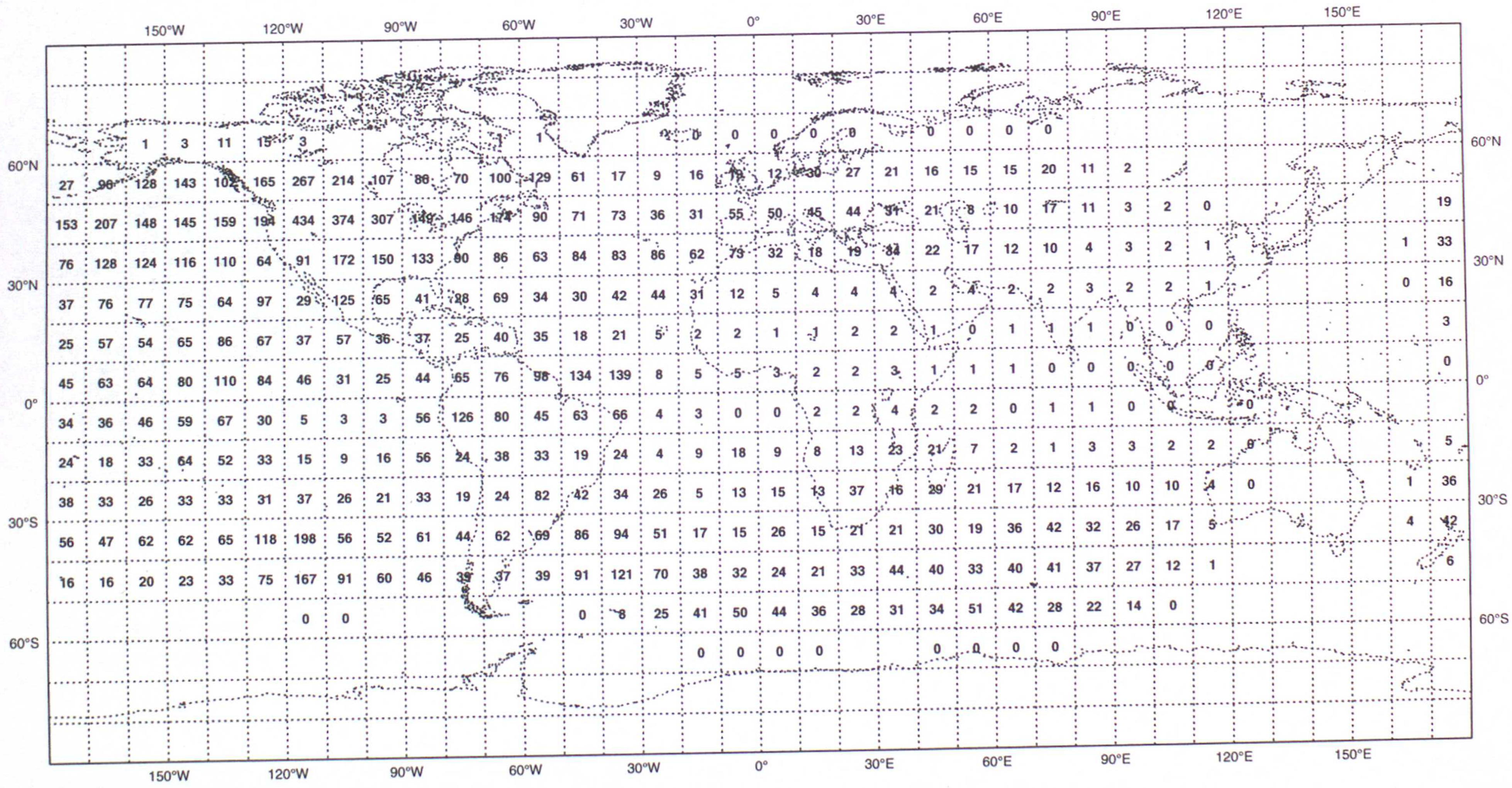

150°W
120°W
90°W
60°W
30°W
0°
30°E
60°E
90°E
120°E
150°E
60°N
30°N
0°
30°S
60°S
1 3 11 15 3 1 1 0 0 0 0 0 0 0 0 0
27 96 128 143 102 165 267 214 107 86 70 100 129 61 17 9 16 19 12 30 27 21 16 15 15 20 11 2
153 207 148 145 159 194 434 374 307 148 146 174 90 71 73 36 31 55 50 45 44 31 21 8 10 17 11 3 2 0 19
76 128 124 116 110 64 91 172 150 133 80 86 63 84 83 86 62 73 32 18 19 34 22 17 12 10 4 3 2 1 1 33
37 76 77 75 64 97 29 125 65 41 28 69 34 30 42 44 31 12 5 4 4 4 2 4 2 2 3 2 2 1 0 16
25 57 54 65 86 67 37 57 36 37 25 40 35 18 21 5 2 2 1 1 2 2 1 0 1 1 1 0 0 0 3
45 63 64 80 110 84 46 31 25 44 65 76 98 134 139 8 5 5 3 2 2 3 1 1 1 0 0 0 0 0 0
34 36 46 59 67 30 5 3 3 56 126 80 45 63 66 4 3 0 0 2 2 4 2 2 0 1 1 0 0 0
24 18 33 64 52 33 15 9 16 56 24 38 33 19 24 4 9 18 9 8 13 23 21 7 2 1 3 3 2 2 8 5
38 33 26 33 33 31 37 26 21 33 19 24 82 42 34 26 5 13 15 13 37 16 29 21 17 12 16 10 10 4 0 1 36
56 47 62 62 65 118 198 56 52 61 44 62 69 86 94 51 17 15 26 15 21 21 30 19 36 42 32 26 17 5 4 42
16 16 20 23 33 75 167 91 60 46 39 37 39 91 121 70 38 32 24 21 33 44 40 33 40 41 37 27 12 1 6
0 0 0 8 25 41 50 44 36 28 31 34 51 42 28 22 14 0
0 0 0 0 0 0 0 0

Figure 16. SATOB 401 - 700 hPa vector mean wind. MAY 2004
All observations
Arrows are plotted where greater than 10 obs are present

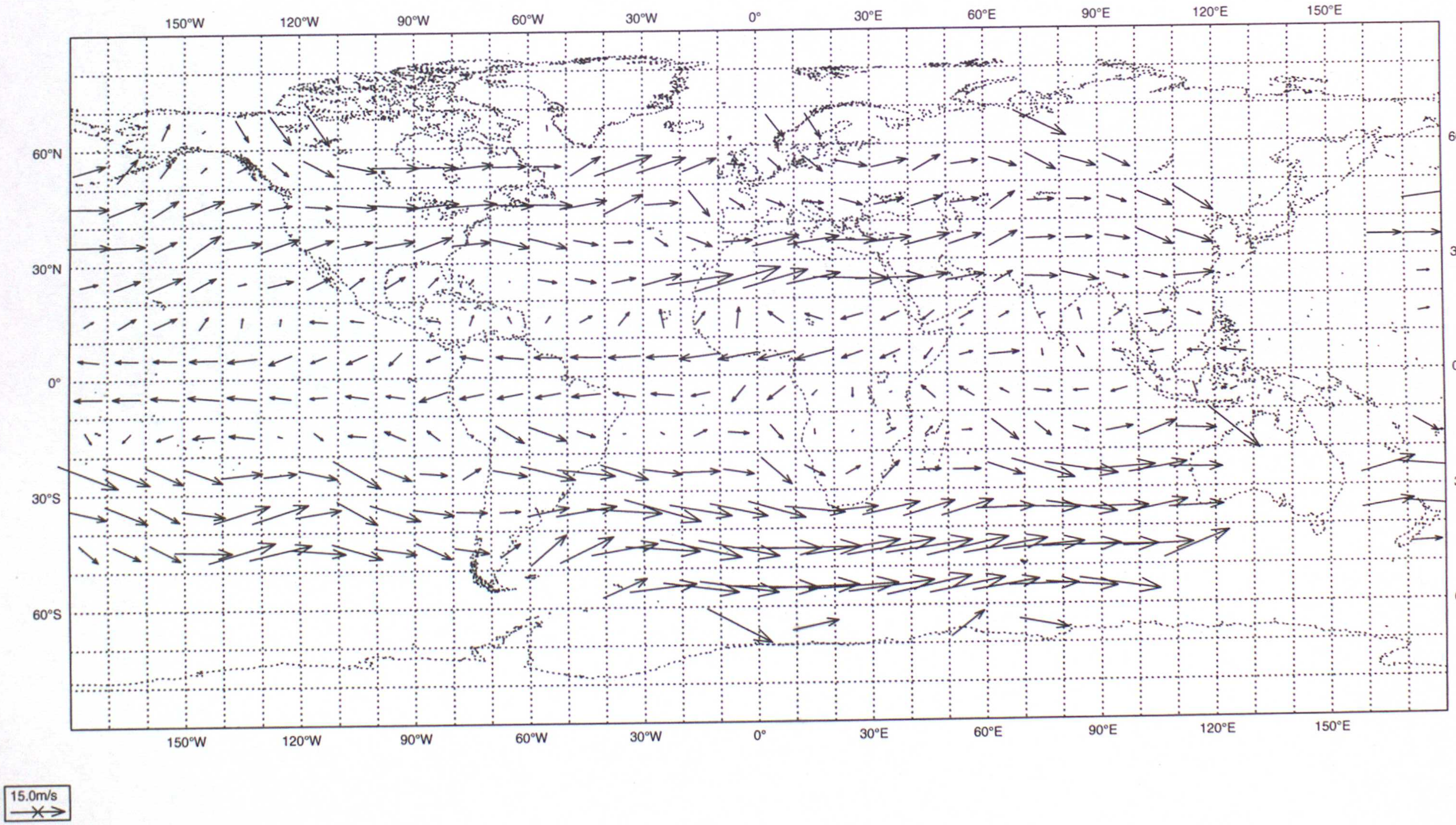

150°W
120°W
90°W
60°W
30°W
0°
30°E
60°E
90°E
120°E
150°E
60°N
30°N
0°
30°S
60°S
15.0m/s

Figure 17. SATOB 401 - 700 hPa mean vector wind differences. MAY 2004
All observations
Arrows are plotted where greater than 10 obs are present

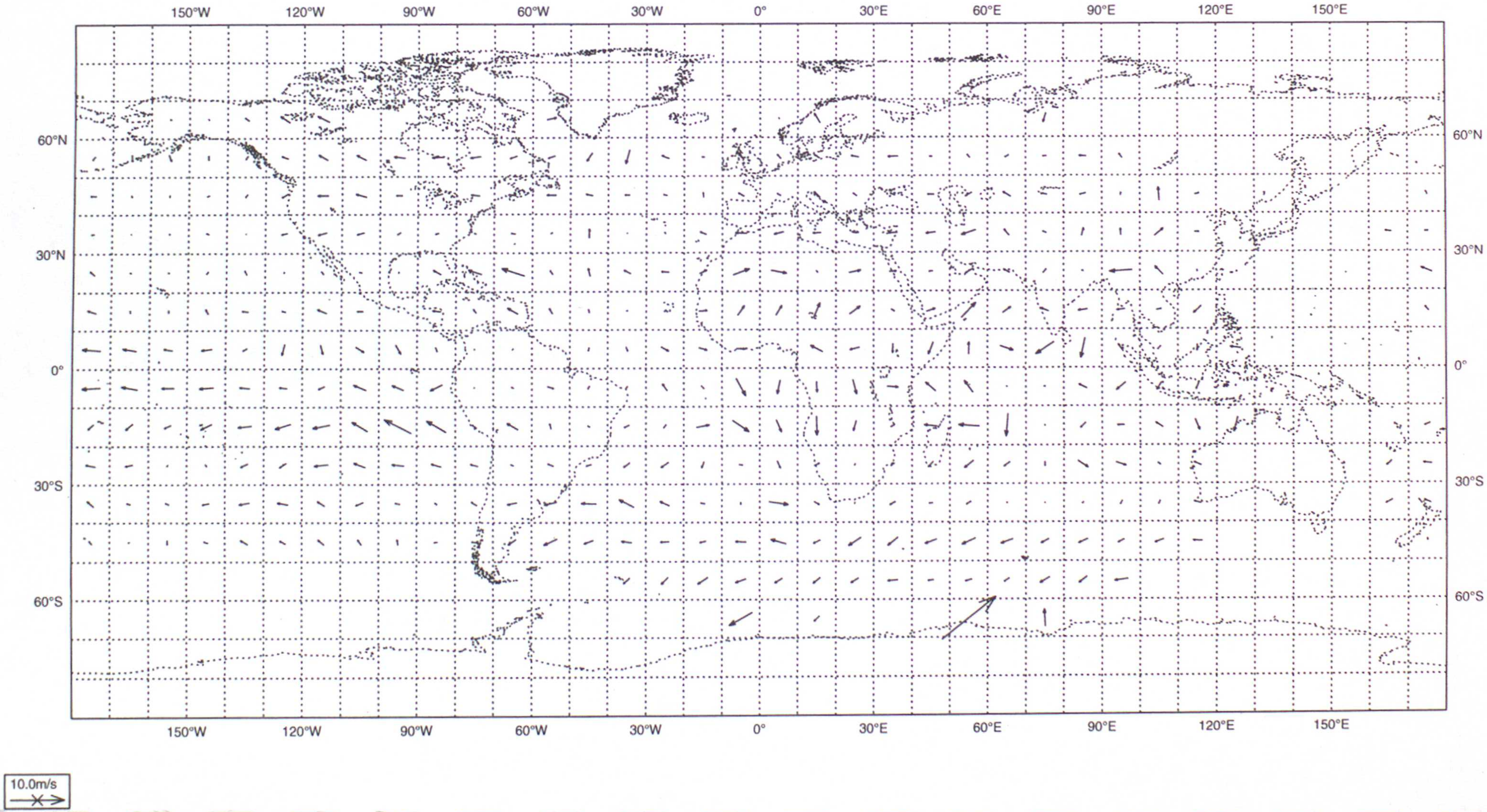

150°W
120°W
90°W
60°W
30°W
0°
30°E
60°E
90°E
120°E
150°E
60°N
30°N
0°
30°S
60°S
10.0m/s

Figure 18. SATOB 401 - 700 hPa mean O-B speed differences (ms-1). MAY 2004
All observations
Values are plotted where greater than 10 obs are present

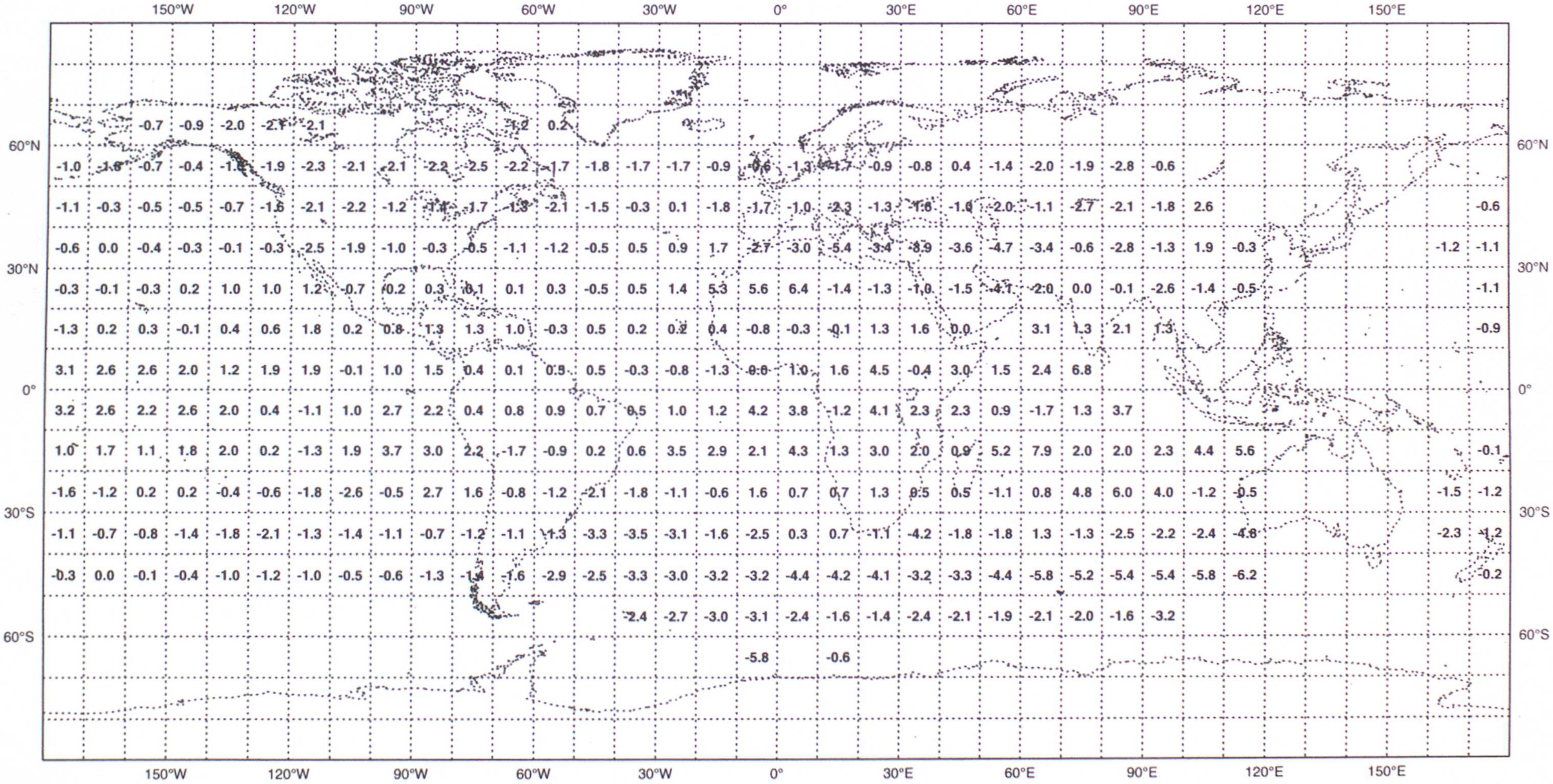

150°W 120°W 90°W 60°W 30°W 0° 30°E 60°E 90°E 120°E 150°E
60°N 30°N 0° 30°S 60°S
-0.7 -0.9 -2.0 -2.1 -2.1 -1.2 0.2
-1.0 -1.6 -0.7 -0.4 -1.8 -1.9 -2.3 -2.1 -2.1 -2.2 -2.5 -2.2 -1.7 -1.8 -1.7 -1.7 -0.9 -0.6 -1.3 -1.7 -0.9 -0.8 0.4 -1.4 -2.0 -1.9 -2.8 -0.6
-1.1 -0.3 -0.5 -0.5 -0.7 -1.6 -2.1 -2.2 -1.2 -1.4 -1.7 -1.8 -2.1 -1.5 -0.3 0.1 -1.8 -1.7 -1.0 -2.3 -1.3 -1.6 -1.6 -2.0 -1.1 -2.7 -2.1 -1.8 2.6 -0.6
-0.6 0.0 -0.4 -0.3 -0.1 -0.3 -2.5 -1.9 -1.0 -0.3 -0.5 -1.1 -1.2 -0.5 0.5 0.9 1.7 -2.7 -3.0 -5.4 -3.4 -3.9 -3.6 -4.7 -3.4 -0.6 -2.8 -1.3 1.9 -0.3 -1.2 -1.1
-0.3 -0.1 -0.3 0.2 1.0 1.0 1.2 -0.7 0.2 0.3 0.1 0.1 0.3 -0.5 0.5 1.4 5.3 5.6 6.4 -1.4 -1.3 -1.0 -1.5 -4.1 -2.0 0.0 -0.1 -2.6 -1.4 -0.5 -1.1
-1.3 0.2 0.3 -0.1 0.4 0.6 1.8 0.2 0.8 1.3 1.3 1.0 -0.3 0.5 0.2 0.2 0.4 -0.8 -0.3 -0.1 1.3 1.6 0.0 3.1 1.3 2.1 1.3 -0.9
3.1 2.6 2.6 2.0 1.2 1.9 1.9 -0.1 1.0 1.5 0.4 0.1 0.5 0.5 -0.3 -0.8 -1.3 0.0 1.0 1.6 4.5 -0.4 3.0 1.5 2.4 6.8
3.2 2.6 2.2 2.6 2.0 0.4 -1.1 1.0 2.7 2.2 0.4 0.8 0.9 0.7 0.5 1.0 1.2 4.2 3.8 -1.2 4.1 2.3 2.3 0.9 -1.7 1.3 3.7
1.0 1.7 1.1 1.8 2.0 0.2 -1.3 1.9 3.7 3.0 2.2 -1.7 -0.9 0.2 0.6 3.5 2.9 2.1 4.3 1.3 3.0 2.0 0.9 5.2 7.9 2.0 2.0 2.3 4.4 5.6 -0.1
-1.6 -1.2 0.2 0.2 -0.4 -0.6 -1.8 -2.6 -0.5 2.7 1.6 -0.8 -1.2 -2.1 -1.8 -1.1 -0.6 1.6 0.7 0.7 1.3 0.5 0.5 -1.1 0.8 4.8 6.0 4.0 -1.2 -0.5 -1.5 -1.2
-1.1 -0.7 -0.8 -1.4 -1.8 -2.1 -1.3 -1.4 -1.1 -0.7 -1.2 -1.1 -1.3 -3.3 -3.5 -3.1 -1.6 -2.5 0.3 0.7 -1.1 -4.2 -1.8 -1.8 1.3 -1.3 -2.5 -2.2 -2.4 -4.8 -2.3 -1.2
-0.3 0.0 -0.1 -0.4 -1.0 -1.2 -1.0 -0.5 -0.6 -1.3 -1.4 -1.6 -2.9 -2.5 -3.3 -3.0 -3.2 -3.2 -4.4 -4.2 -4.1 -3.2 -3.3 -4.4 -5.8 -5.2 -5.4 -5.4 -5.8 -6.2 -0.2
-2.4 -2.7 -3.0 -3.1 -2.4 -1.6 -1.4 -2.4 -2.1 -1.9 -2.1 -2.0 -1.6 -3.2
-5.8 -0.6

Figure 19. SATOB 401 - 700 hPa mean RMS O-B vector differences (ms-1). MAY 2004
All observations
Values are plotted where greater than 10 obs are present

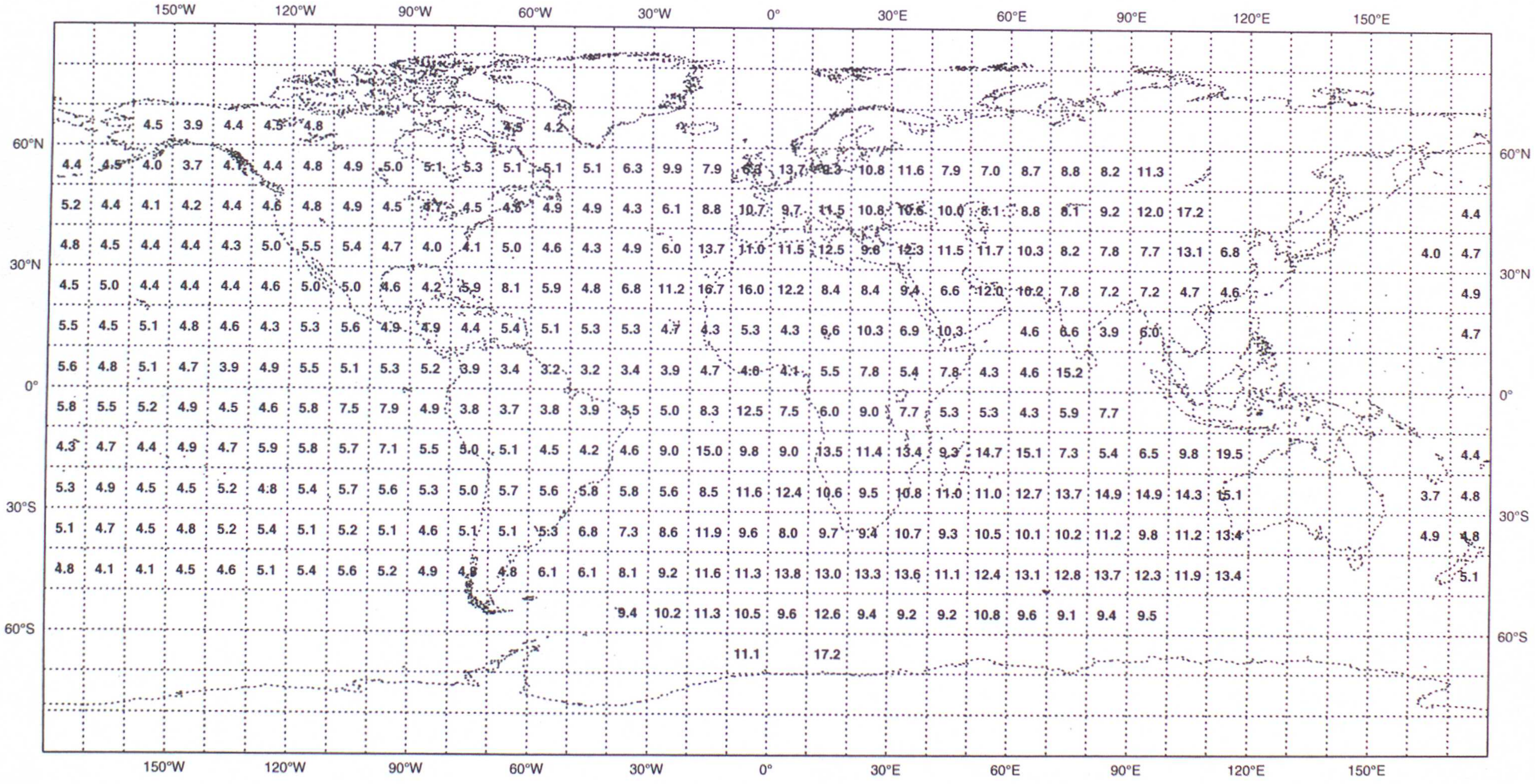

150°W
120°W
90°W
60°W
30°W
0°
30°E
60°E
90°E
120°E
150°E
60°N
30°N
0°
30°S
60°S
4.5 3.9 4.4 4.5 4.8 4.5 4.2
4.4 4.5 4.0 3.7 4.1 4.4 4.8 4.9 5.0 5.1 5.3 5.1 5.1 5.1 6.3 9.9 7.9 6.8 13.7 8.3 10.8 11.6 7.9 7.0 8.7 8.8 8.2 11.3
5.2 4.4 4.1 4.2 4.4 4.6 4.8 4.9 4.5 4.7 4.5 4.5 4.9 4.9 4.3 6.1 8.8 10.7 9.7 11.5 10.8 10.6 10.0 8.1 8.8 8.1 9.2 12.0 17.2 4.4
4.8 4.5 4.4 4.4 4.3 5.0 5.5 5.4 4.7 4.0 4.1 5.0 4.6 4.3 4.9 6.0 13.7 11.0 11.5 12.5 9.6 12.3 11.5 11.7 10.3 8.2 7.8 7.7 13.1 6.8 4.0 4.7
4.5 5.0 4.4 4.4 4.4 4.6 5.0 5.0 4.6 4.2 5.9 8.1 5.9 4.8 6.8 11.2 16.7 16.0 12.2 8.4 8.4 9.4 6.6 12.0 10.2 7.8 7.2 7.2 4.7 4.6 4.9
5.5 4.5 5.1 4.8 4.6 4.3 5.3 5.6 4.9 4.9 4.4 5.4 5.1 5.3 5.3 4.7 4.3 5.3 4.3 6.6 10.3 6.9 10.3 4.6 6.6 3.9 6.0 4.7
5.6 4.8 5.1 4.7 3.9 4.9 5.5 5.1 5.3 5.2 3.9 3.4 3.2 3.2 3.4 3.9 4.7 4.8 4.1 5.5 7.8 5.4 7.8 4.3 4.6 15.2
5.8 5.5 5.2 4.9 4.5 4.6 5.8 7.5 7.9 4.9 3.8 3.7 3.8 3.9 3.5 5.0 8.3 12.5 7.5 6.0 9.0 7.7 5.3 5.3 4.3 5.9 7.7
4.3 4.7 4.4 4.9 4.7 5.9 5.8 5.7 7.1 5.5 5.0 5.1 4.5 4.2 4.6 9.0 15.0 9.8 9.0 13.5 11.4 13.4 9.3 14.7 15.1 7.3 5.4 6.5 9.8 19.5 4.4
5.3 4.9 4.5 4.5 5.2 4.8 5.4 5.7 5.6 5.3 5.0 5.7 5.6 5.8 5.8 5.6 8.5 11.6 12.4 10.6 9.5 10.8 11.0 11.0 12.7 13.7 14.9 14.9 14.3 15.1 3.7 4.8
5.1 4.7 4.5 4.8 5.2 5.4 5.1 5.2 5.1 4.6 5.1 5.1 5.3 6.8 7.3 8.6 11.9 9.6 8.0 9.7 9.4 10.7 9.3 10.5 10.1 10.2 11.2 9.8 11.2 13.4 4.9 4.8
4.8 4.1 4.1 4.5 4.6 5.1 5.4 5.6 5.2 4.9 4.8 4.8 6.1 6.1 8.1 9.2 11.6 11.3 13.8 13.0 13.3 13.6 11.1 12.4 13.1 12.8 13.7 12.3 11.9 13.4 5.1
9.4 10.2 11.3 10.5 9.6 12.6 9.4 9.2 9.2 10.8 9.6 9.1 9.4 9.5
11.1 17.2

Figure 20. SATOB 101 - 400 hPa mean daily count. MAY 2004
Global average number of observations in 24 hours = 204720

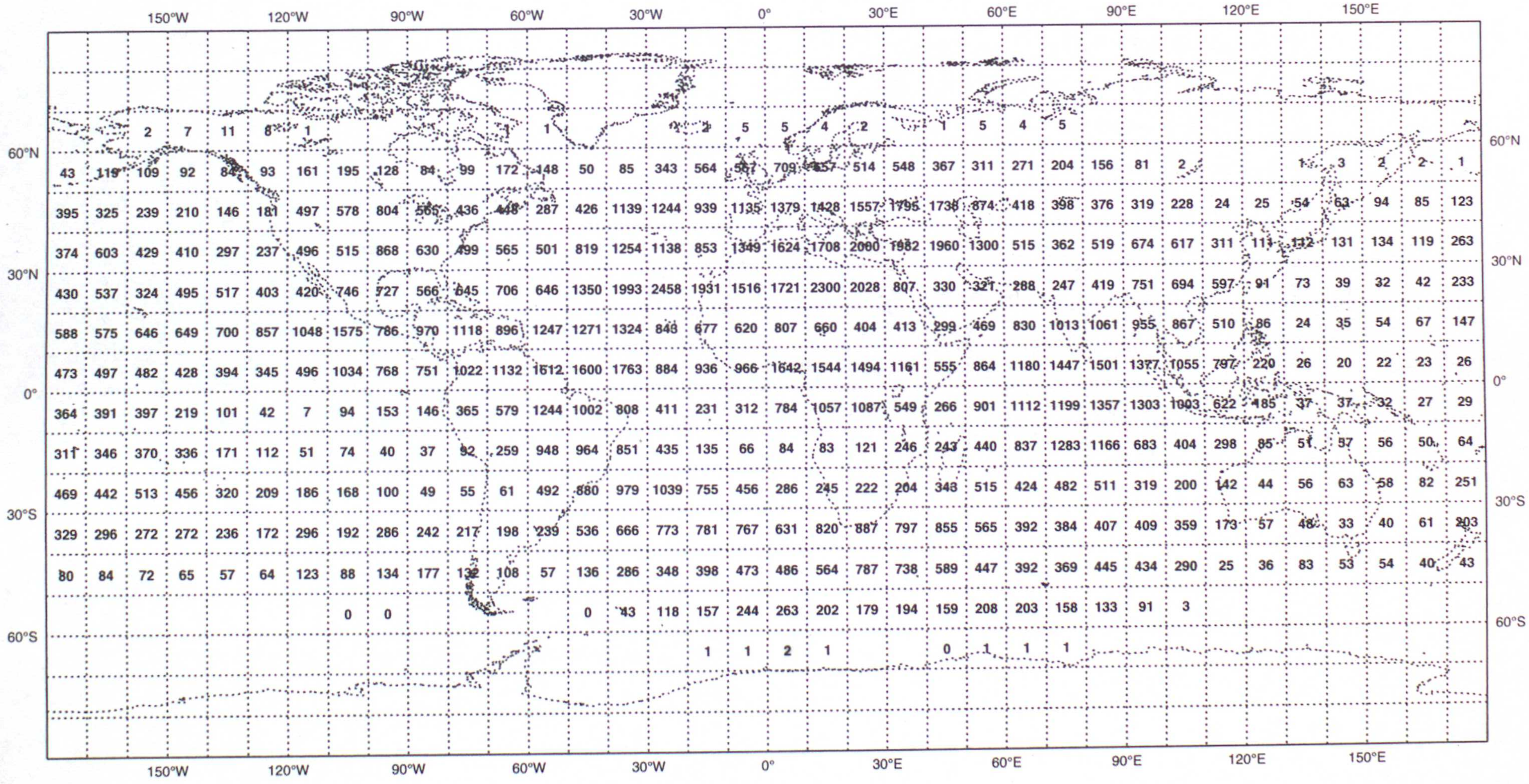

150°W 120°W 90°W 60°W 30°W 0° 30°E 60°E 90°E 120°E 150°E
60°N
30°N
0°
30°S
60°S
2 7 11 8 1 1 1 2 5 5 4 2 1 5 4 5
43 119 109 92 84 93 161 195 128 84 99 172 148 50 85 343 564 567 709 657 514 548 367 311 271 204 156 81 2 1 3 2 2 1
395 325 239 210 146 181 497 578 804 565 436 448 287 426 1139 1244 939 1135 1379 1428 1557 1795 1738 874 418 398 376 319 228 24 25 54 63 94 85 123
374 603 429 410 297 237 496 515 868 630 499 565 501 819 1254 1138 853 1349 1624 1708 2000 1982 1960 1300 515 362 519 674 617 311 111 112 131 134 119 263
430 537 324 495 517 403 420 746 727 566 645 706 646 1350 1993 2458 1931 1516 1721 2300 2028 807 330 321 288 247 419 751 694 597 91 73 39 32 42 233
588 575 646 649 700 857 1048 1575 786 970 1118 896 1247 1271 1324 848 677 620 807 660 404 413 299 469 830 1013 1061 955 867 510 86 24 35 54 67 147
473 497 482 428 394 345 496 1034 768 751 1022 1132 1612 1600 1763 884 936 966 1642 1544 1494 1161 555 864 1180 1447 1501 1377 1055 797 220 26 20 22 23 26
364 391 397 219 101 42 7 94 153 146 365 579 1244 1002 808 411 231 312 784 1057 1087 549 266 901 1112 1199 1357 1303 1003 622 485 37 37 32 27 29
311 346 370 336 171 112 51 74 40 37 92 259 948 964 851 435 135 66 84 83 121 246 243 440 837 1283 1166 683 404 298 85 51 57 56 50 64
469 442 513 456 320 209 186 168 100 49 55 61 492 880 979 1039 755 456 286 245 222 204 348 515 424 482 511 319 200 142 44 56 63 58 82 251
329 296 272 272 236 172 296 192 286 242 217 198 239 536 666 773 781 767 631 820 887 797 855 565 392 384 407 409 359 173 57 48 33 40 61 203
80 84 72 65 57 64 123 88 134 177 132 108 57 136 286 348 398 473 486 564 787 738 589 447 392 369 445 434 290 25 36 83 53 54 40 43
0 0 0 43 118 157 244 263 202 179 194 159 208 203 158 133 91 3
1 1 2 1 0 1 1 1

Figure 21. SATOB 101 - 400 hPa vector mean wind. MAY 2004
All observations
Arrows are plotted where greater than 10 obs are present

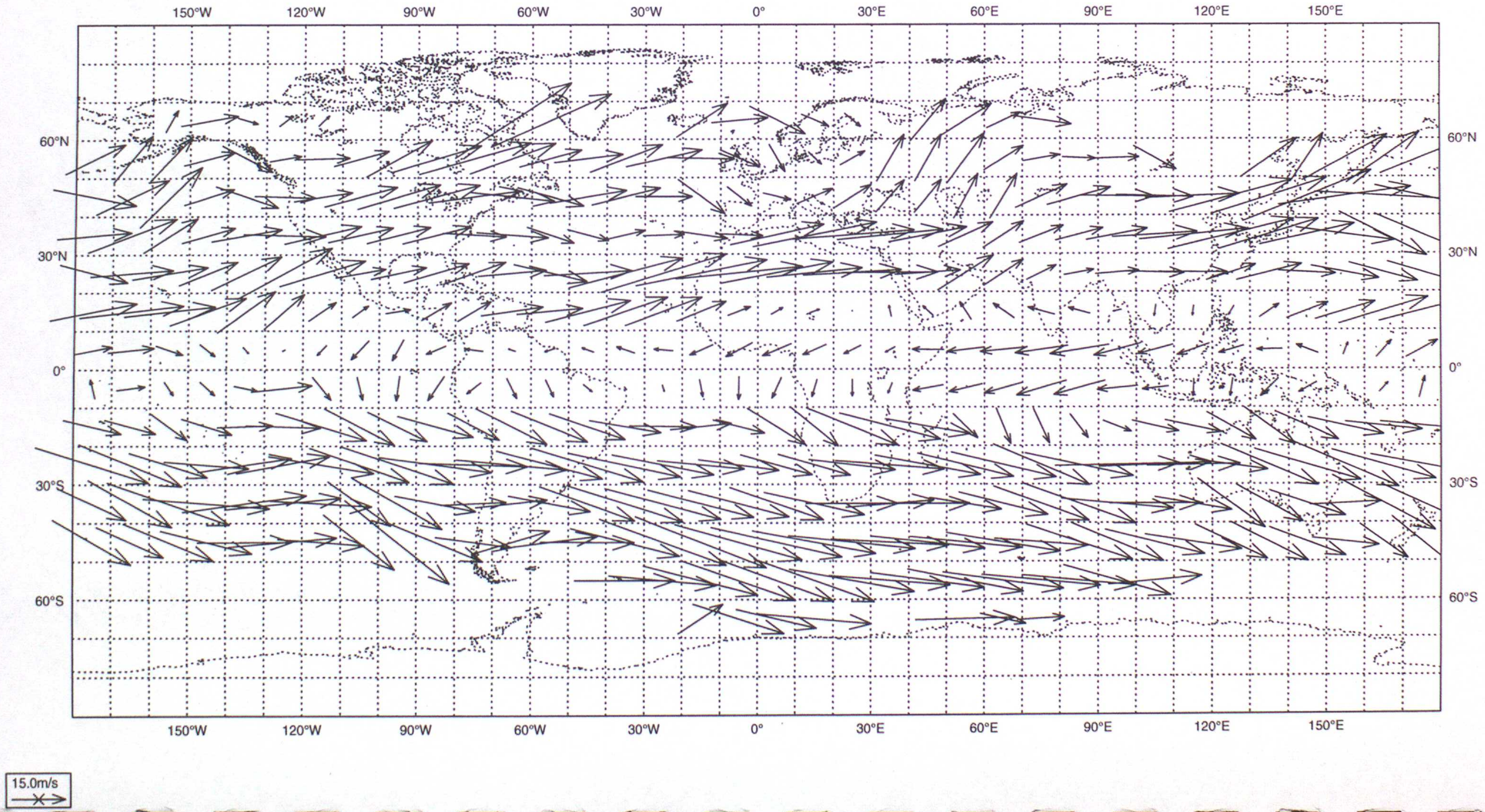

150°W
120°W
90°W
60°W
30°W
0°
30°E
60°E
90°E
120°E
150°E
60°N
30°N
0°
30°S
60°S
15.0m/s

Figure 22. SATOB 101 - 400 hPa mean vector wind differences. MAY 2004
All observations
Arrows are plotted where greater than 10 obs are present

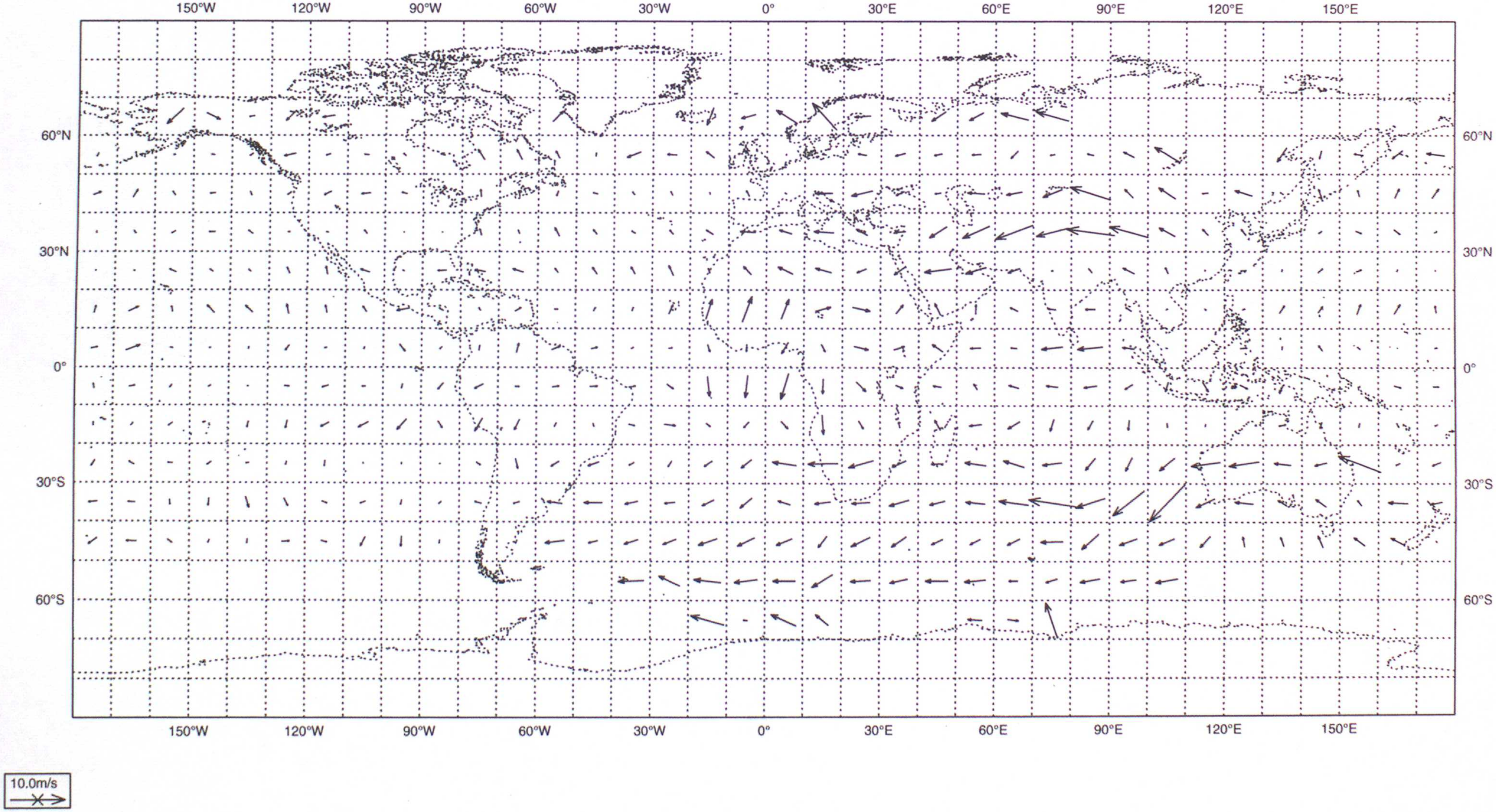

150°W
120°W
90°W
60°W
30°W
0°
30°E
60°E
90°E
120°E
150°E
60°N
30°N
0°
30°S
60°S
10.0m/s

Figure 23. SATOB 101 - 400 hPa mean O-B speed differences (ms-1). MAY 2004
All observations
Values are plotted where greater than 10 obs are present

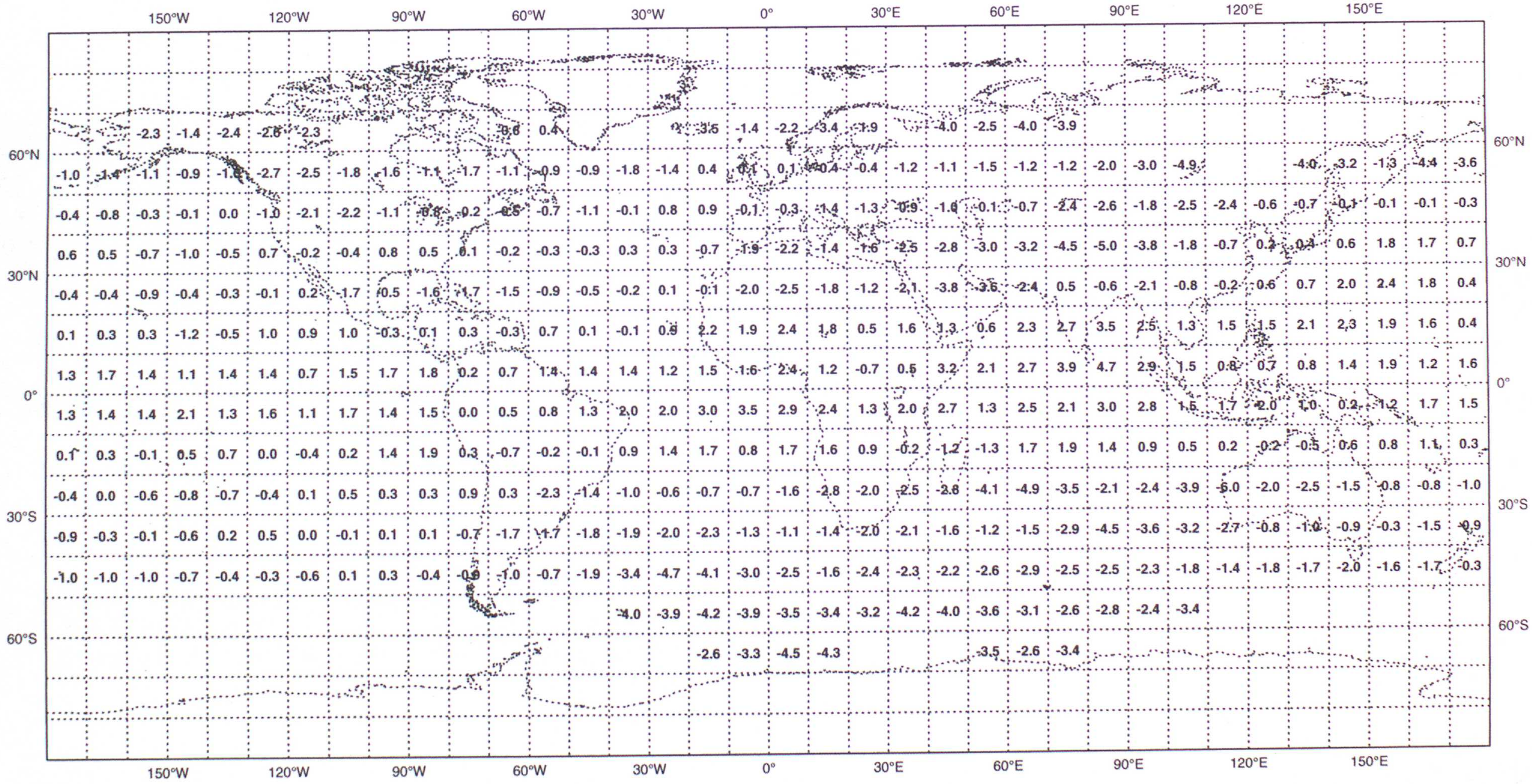
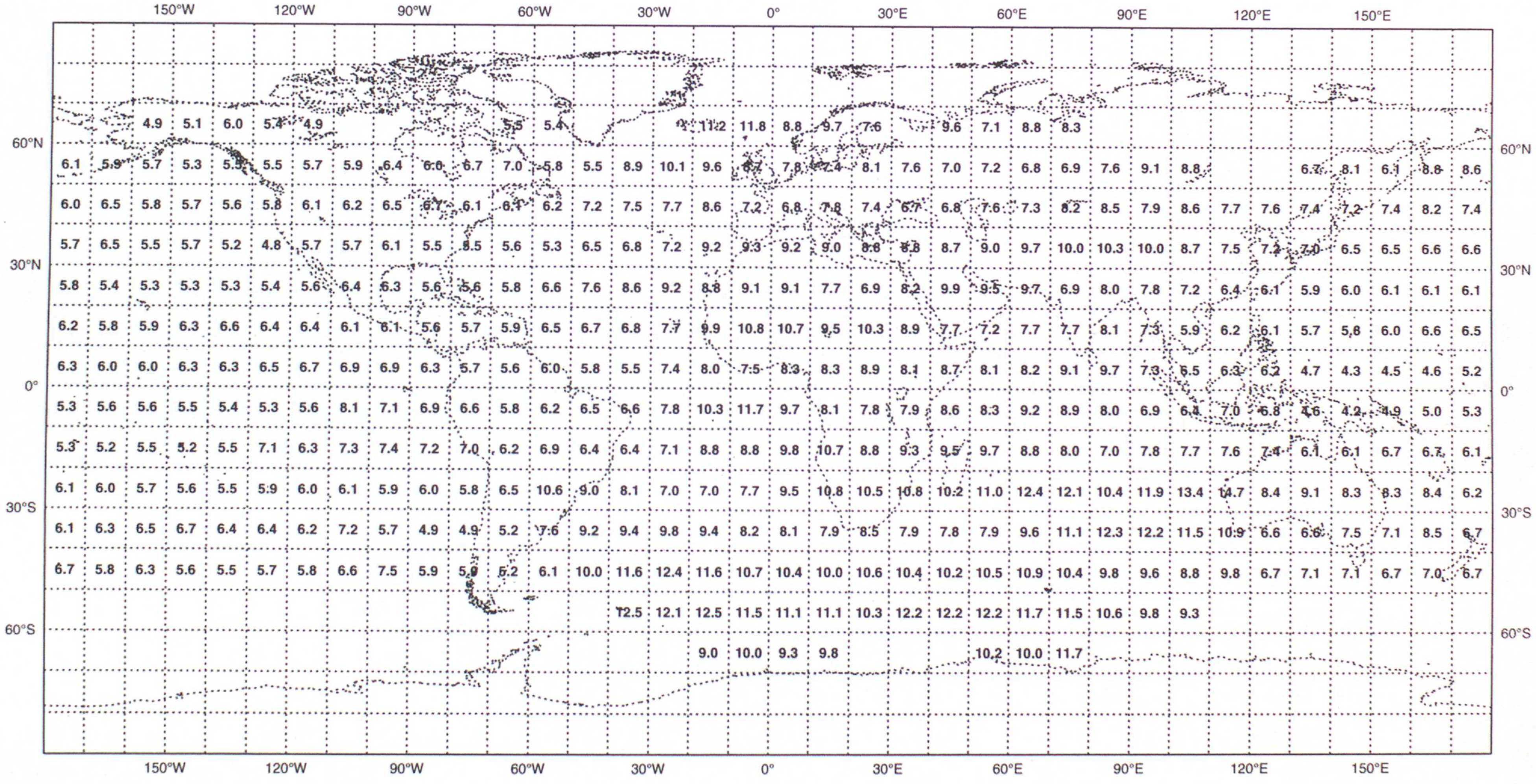

150°W
120°W
90°W
60°W
30°W
0°
30°E
60°E
90°E
120°E
150°E
60°N
30°N
0°
30°S
60°S
-2.3 -1.4 -2.4 -2.6 -2.3 -0.6 0.4 -3.5 -1.4 -2.2 -3.4 -1.9 -4.0 -2.5 -4.0 -3.9
-1.0 -1.4 -1.1 -0.9 -1.8 -2.7 -2.5 -1.8 -1.6 -1.1 -1.7 -1.1 -0.9 -0.9 -1.8 -1.4 0.4 -0.1 0.1 -0.4 -0.4 -1.2 -1.1 -1.5 -1.2 -1.2 -2.0 -3.0 -4.9 -4.0 -3.2 -1.3 -4.4 -3.6
-0.4 -0.8 -0.3 -0.1 0.0 -1.0 -2.1 -2.2 -1.1 -0.8 -0.2 -0.5 -0.7 -1.1 -0.1 0.8 0.9 -0.1 -0.3 -1.4 -1.3 -0.9 -1.6 -0.1 -0.7 -2.4 -2.6 -1.8 -2.5 -2.4 -0.6 -0.7 -0.1 -0.1 -0.1 -0.3
0.6 0.5 -0.7 -1.0 -0.5 0.7 -0.2 -0.4 0.8 0.5 0.1 -0.2 -0.3 -0.3 0.3 0.3 -0.7 -1.9 -2.2 -1.4 -1.6 -2.5 -2.8 -3.0 -3.2 -4.5 -5.0 -3.8 -1.8 -0.7 0.2 0.4 0.6 1.8 1.7 0.7
-0.4 -0.4 -0.9 -0.4 -0.3 -0.1 0.2 -1.7 -0.5 -1.6 -1.7 -1.5 -0.9 -0.5 -0.2 0.1 -0.1 -2.0 -2.5 -1.8 -1.2 -2.1 -3.8 -3.6 -2.4 0.5 -0.6 -2.1 -0.8 -0.2 -0.6 0.7 2.0 2.4 1.8 0.4
0.1 0.3 0.3 -1.2 -0.5 1.0 0.9 1.0 -0.3 0.1 0.3 -0.3 0.7 0.1 -0.1 0.8 2.2 1.9 2.4 1.8 0.5 1.6 1.3 0.6 2.3 2.7 3.5 2.5 1.3 1.5 1.5 2.1 2.3 1.9 1.6 0.4
1.3 1.7 1.4 1.1 1.4 1.4 0.7 1.5 1.7 1.8 0.2 0.7 1.4 1.4 1.4 1.2 1.5 1.6 2.4 1.2 -0.7 0.5 3.2 2.1 2.7 3.9 4.7 2.9 1.5 0.8 0.7 0.8 1.4 1.9 1.2 1.6
1.3 1.4 1.4 2.1 1.3 1.6 1.1 1.7 1.4 1.5 0.0 0.5 0.8 1.3 2.0 2.0 3.0 3.5 2.9 2.4 1.3 2.0 2.7 1.3 2.5 2.1 3.0 2.8 1.6 1.7 2.0 1.0 0.2 1.2 1.7 1.5
0.1 0.3 -0.1 0.5 0.7 0.0 -0.4 0.2 1.4 1.9 0.3 -0.7 -0.2 -0.1 0.9 1.4 1.7 0.8 1.7 1.6 0.9 -0.2 -1.2 -1.3 1.7 1.9 1.4 0.9 0.5 0.2 -0.2 -0.5 0.6 0.8 1.1 0.3
-0.4 0.0 -0.6 -0.8 -0.7 -0.4 0.1 0.5 0.3 0.3 0.9 0.3 -2.3 -1.4 -1.0 -0.6 -0.7 -0.7 -1.6 -2.8 -2.0 -2.5 -2.8 -4.1 -4.9 -3.5 -2.1 -2.4 -3.9 -6.0 -2.0 -2.5 -1.5 -0.8 -0.8 -1.0
-0.9 -0.3 -0.1 -0.6 0.2 0.5 0.0 -0.1 0.1 0.1 -0.7 -1.7 -1.7 -1.8 -1.9 -2.0 -2.3 -1.3 -1.1 -1.4 -2.0 -2.1 -1.6 -1.2 -1.5 -2.9 -4.5 -3.6 -3.2 -2.7 -0.8 -1.0 -0.9 -0.3 -1.5 -0.9
-1.0 -1.0 -1.0 -0.7 -0.4 -0.3 -0.6 0.1 0.3 -0.4 -0.9 -1.0 -0.7 -1.9 -3.4 -4.7 -4.1 -3.0 -2.5 -1.6 -2.4 -2.3 -2.2 -2.6 -2.9 -2.5 -2.5 -2.3 -1.8 -1.4 -1.8 -1.7 -2.0 -1.6 -1.7 -0.3
-4.0 -3.9 -4.2 -3.9 -3.5 -3.4 -3.2 -4.2 -4.0 -3.6 -3.1 -2.6 -2.8 -2.4 -3.4
-2.6 -3.3 -4.5 -4.3 -3.5 -2.6 -3.4

Figure 24. SATOB 101 - 400 hPa mean RMS O-B vector differences (ms-1). MAY 2004
All observations
Values are plotted where greater than 10 obs are present


150°W
120°W
90°W
60°W
30°W
0°
30°E
60°E
90°E
120°E
150°E
60°N
30°N
0°
30°S
60°S
4.9 5.1 6.0 5.4 4.9 5.5 5.4 11.2 11.8 8.8 9.7 7.6 9.6 7.1 8.8 8.3
6.1 5.9 5.7 5.3 5.3 5.5 5.7 5.9 6.4 6.0 6.7 7.0 5.8 5.5 8.9 10.1 9.6 6.7 7.8 7.4 8.1 7.6 7.0 7.2 6.8 6.9 7.6 9.1 8.8 6.7 8.1 6.1 8.8 8.6
6.0 6.5 5.8 5.7 5.6 5.8 6.1 6.2 6.5 6.7 6.1 6.1 6.2 7.2 7.5 7.7 8.6 7.2 6.8 7.8 7.4 6.7 6.8 7.6 7.3 8.2 8.5 7.9 8.6 7.7 7.6 7.4 7.2 7.4 8.2 7.4
5.7 6.5 5.5 5.7 5.2 4.8 5.7 5.7 6.1 5.5 8.5 5.6 5.3 6.5 6.8 7.2 9.2 9.3 9.2 9.0 8.6 8.8 8.7 9.0 9.7 10.0 10.3 10.0 8.7 7.5 7.2 7.0 6.5 6.5 6.6 6.6
5.8 5.4 5.3 5.3 5.3 5.4 5.6 6.4 6.3 5.6 5.6 5.8 6.6 7.6 8.6 9.2 8.8 9.1 9.1 7.7 6.9 8.2 9.9 9.5 9.7 6.9 8.0 7.8 7.2 6.4 6.1 5.9 6.0 6.1 6.1 6.1
6.2 5.8 5.9 6.3 6.6 6.4 6.4 6.1 6.1 5.6 5.7 5.9 6.5 6.7 6.8 7.7 9.9 10.8 10.7 9.5 10.3 8.9 7.7 7.2 7.7 7.7 8.1 7.3 5.9 6.2 6.1 5.7 5.8 6.0 6.6 6.5
6.3 6.0 6.0 6.3 6.3 6.5 6.7 6.9 6.9 6.3 5.7 5.6 6.0 5.8 5.5 7.4 8.0 7.5 8.3 8.3 8.9 8.1 8.7 8.1 8.2 9.1 9.7 7.3 6.5 6.3 6.2 4.7 4.3 4.5 4.6 5.2
5.3 5.6 5.6 5.5 5.4 5.3 5.6 8.1 7.1 6.9 6.6 5.8 6.2 6.5 6.6 7.8 10.3 11.7 9.7 8.1 7.8 7.9 8.6 8.3 9.2 8.9 8.0 6.9 6.4 7.0 6.8 4.6 4.2 4.9 5.0 5.3
5.3 5.2 5.5 5.2 5.5 7.1 6.3 7.3 7.4 7.2 7.0 6.2 6.9 6.4 6.4 7.1 8.8 8.8 9.8 10.7 8.8 9.3 9.5 9.7 8.8 8.0 7.0 7.8 7.7 7.6 7.4 6.1 6.1 6.7 6.7 6.1
6.1 6.0 5.7 5.6 5.5 5.9 6.0 6.1 5.9 6.0 5.8 6.5 10.6 9.0 8.1 7.0 7.0 7.7 9.5 10.8 10.5 10.8 10.2 11.0 12.4 12.1 10.4 11.9 13.4 14.7 8.4 9.1 8.3 8.3 8.4 6.2
6.1 6.3 6.5 6.7 6.4 6.4 6.2 7.2 5.7 4.9 4.9 5.2 7.6 9.2 9.4 9.8 9.4 8.2 8.1 7.9 8.5 7.9 7.8 7.9 9.6 11.1 12.3 12.2 11.5 10.9 6.6 6.6 7.5 7.1 8.5 6.7
6.7 5.8 6.3 5.6 5.5 5.7 5.8 6.6 7.5 5.9 5.9 5.2 6.1 10.0 11.6 12.4 11.6 10.7 10.4 10.0 10.6 10.4 10.2 10.5 10.9 10.4 9.8 9.6 8.8 9.8 6.7 7.1 7.1 6.7 7.0 6.7
12.5 12.1 12.5 11.5 11.1 11.1 10.3 12.2 12.2 12.2 11.7 11.5 10.6 9.8 9.3
9.0 10.0 9.3 9.8 10.2 10.0 11.7

MONITORING OF SATELLITE TEMPERATURES

MONITORING CENTRE: EXETER

MONTH: May 2004

Monitoring procedures

Period :One calendar month.

Data monitored :Reports from NOAA-15, NOAA-16 and NOAA-17.

Standard of comparison :Background field from UKMO global model.

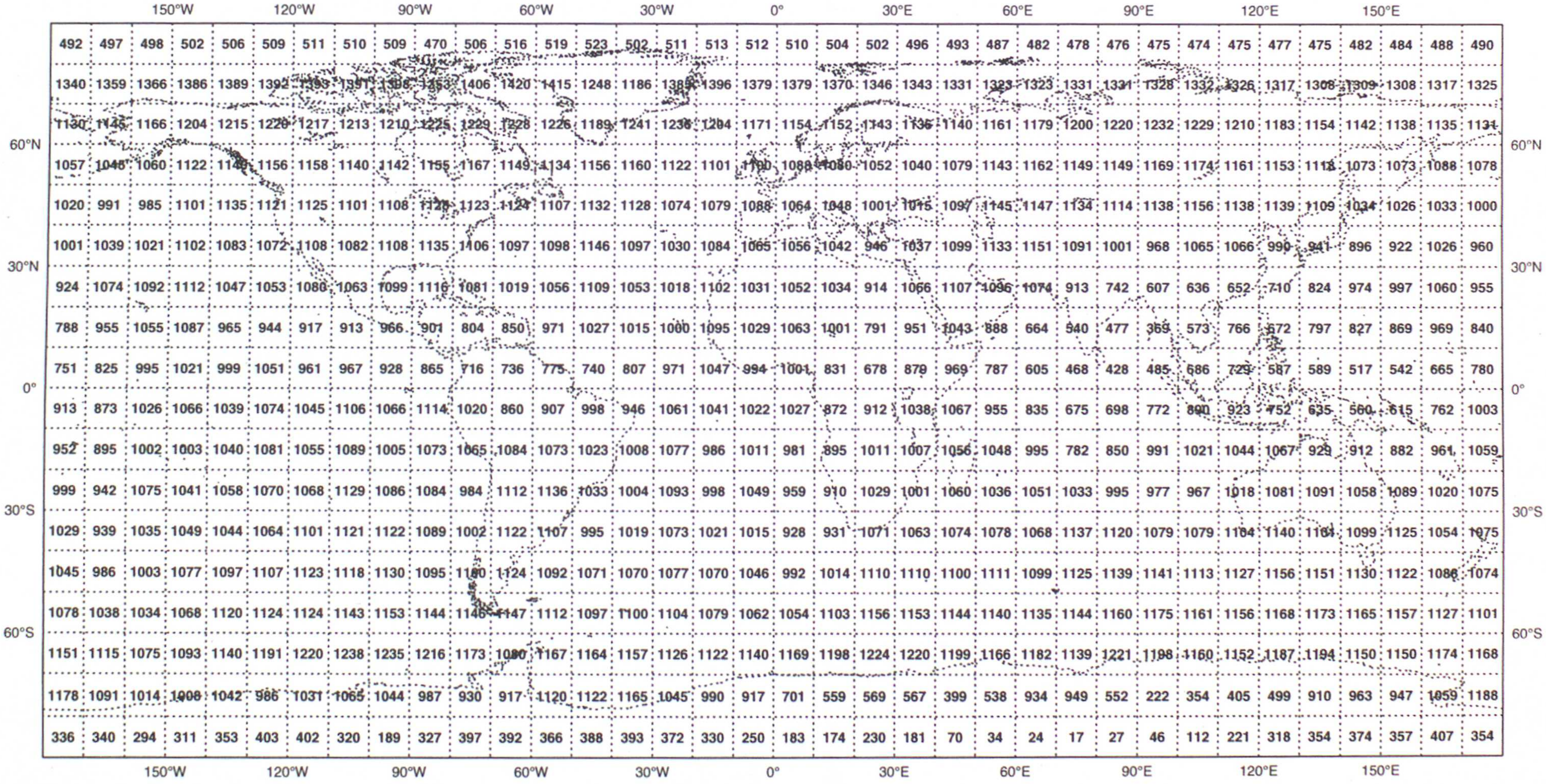
Selection Criteria :All soundings.

Data Extracted :Sounding channels (and approximate weighting function peaks, hPa)

- HIRS8 (Surface)
- HIRS15 (700)
- HIRS11 (500-700)
- HIRS4 (400)
- AMSUA5 (700)
- AMSUA7 (300)
- AMSUA9 (100)

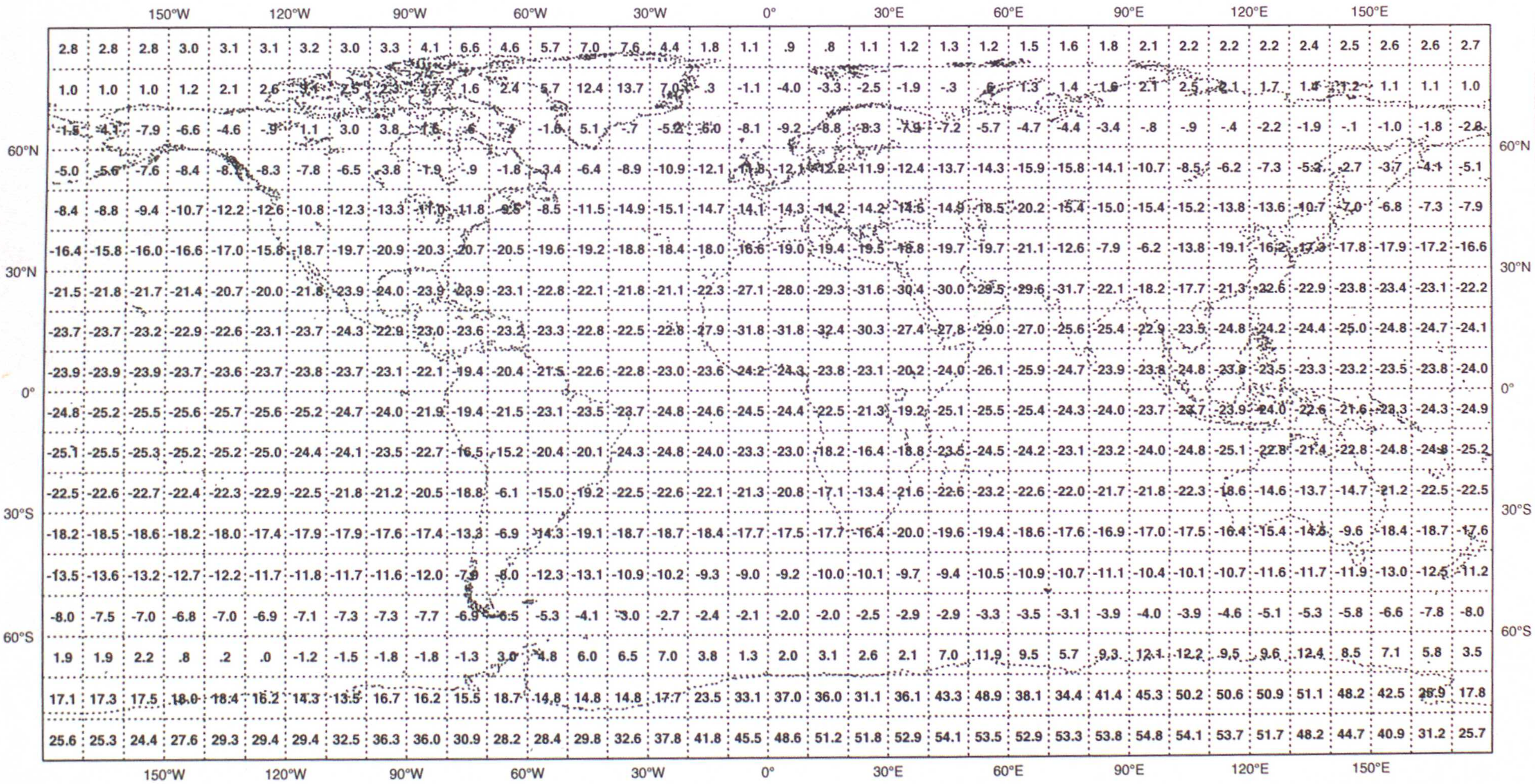
:Mean and standard deviation observation-minus-background brightness temperature differences

Figure 25. ATOVS mean daily count. MAY 2004
NOAA15, using all observations
Global average number of observations in 24 hours = 629085



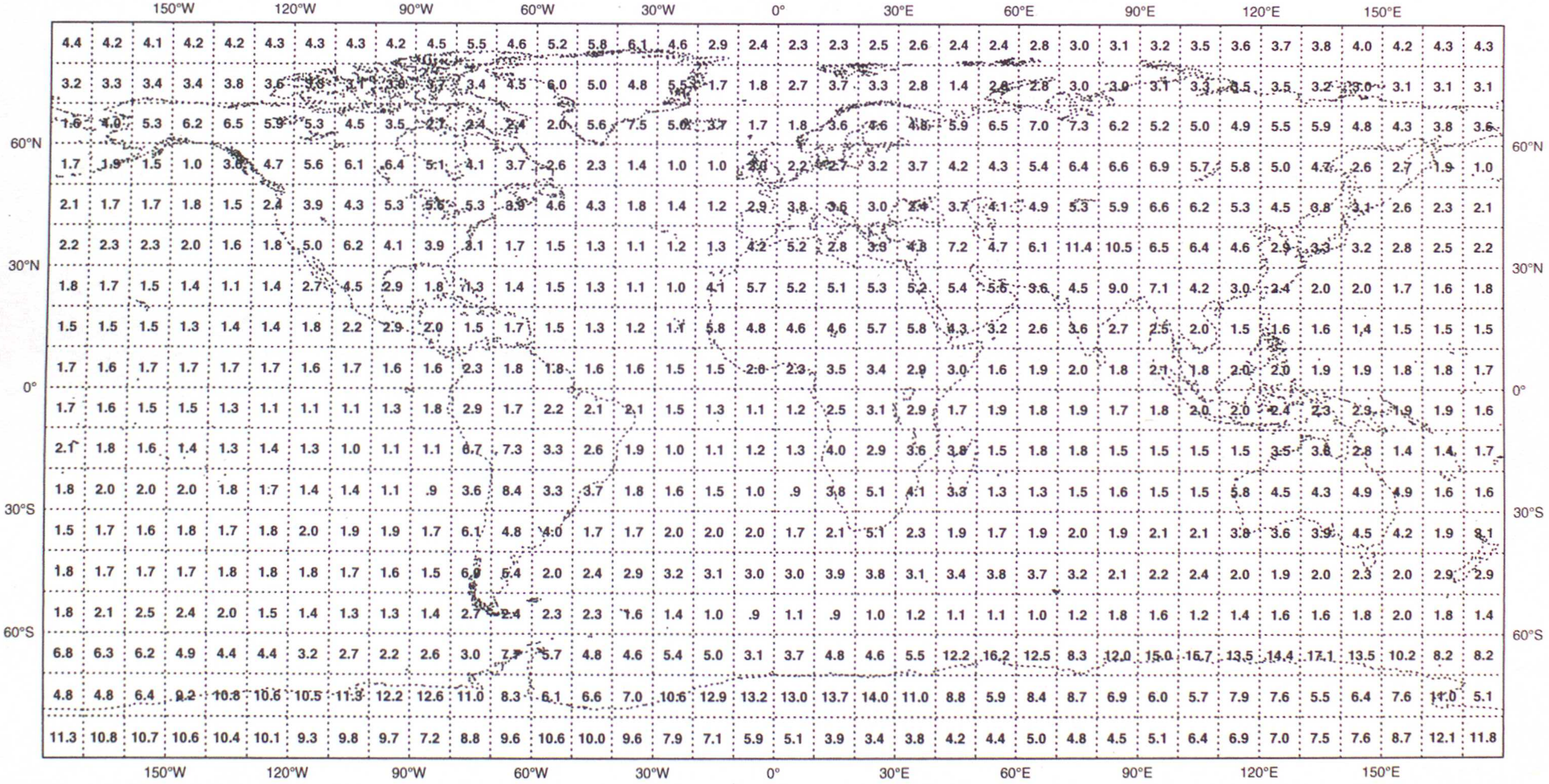
492	497	498	502	506	509	511	510	509	470	506	516	519	523	502	511	513	512	510	504	502	496	493	487	482	478	476	475	474	475	477	475	482	484	488	490
1340	1359	1366	1386	1389	1392	1393	1391	1398	1453	1406	1420	1415	1248	1186	1389	1396	1379	1379	1370	1346	1343	1331	1323	1323	1331	1331	1328	1332	1326	1317	1308	1309	1308	1317	1325
1130	1145	1166	1204	1215	1220	1217	1213	1210	1225	1229	1228	1226	1189	1241	1236	1204	1171	1154	1152	1143	1136	1140	1161	1179	1200	1220	1232	1229	1210	1183	1154	1142	1138	1135	1131
1057	1046	1060	1122	1149	1156	1158	1140	1142	1155	1167	1149	1134	1156	1160	1122	1101	1100	1088	1080	1052	1040	1079	1143	1162	1149	1149	1169	1174	1161	1153	1118	1073	1073	1088	1078
1020	991	985	1101	1135	1121	1125	1101	1108	1128	1123	1124	1107	1132	1128	1074	1079	1088	1064	1048	1001	1015	1097	1145	1147	1134	1114	1138	1156	1138	1139	1109	1034	1026	1033	1000
1001	1039	1021	1102	1083	1072	1108	1082	1108	1135	1106	1097	1098	1146	1097	1030	1084	1065	1056	1042	946	1037	1099	1133	1151	1091	1001	968	1065	1066	990	941	896	922	1026	960
924	1074	1092	1112	1047	1053	1080	1063	1099	1116	1081	1019	1056	1109	1053	1018	1102	1031	1052	1034	914	1066	1107	1096	1074	913	742	607	636	652	710	824	974	997	1060	955
788	955	1055	1087	965	944	917	913	966	901	804	850	971	1027	1015	1000	1095	1029	1063	1001	791	951	1043	888	664	540	477	369	573	766	672	797	827	869	969	840
751	825	995	1021	999	1051	961	967	928	865	716	736	775	740	807	971	1047	994	1001	831	678	879	969	787	605	468	428	485	686	729	587	589	517	542	665	780
913	873	1026	1066	1039	1074	1045	1106	1066	1114	1020	860	907	998	946	1061	1041	1022	1027	872	912	1038	1067	955	835	675	698	772	890	923	752	635	560	615	762	1003
952	895	1002	1003	1040	1081	1055	1089	1005	1073	1065	1084	1073	1023	1008	1077	986	1011	981	895	1011	1007	1056	1048	995	782	850	991	1021	1044	1067	929	912	882	961	1059
999	942	1075	1041	1058	1070	1068	1129	1086	1084	984	1112	1136	1033	1004	1093	998	1049	959	910	1029	1001	1060	1036	1051	1033	995	977	967	1018	1081	1091	1058	1089	1020	1075
1029	939	1035	1049	1044	1064	1101	1121	1122	1089	1002	1122	1107	995	1019	1073	1021	1015	928	931	1071	1063	1074	1078	1068	1137	1120	1079	1079	1104	1140	1164	1099	1125	1054	1075
1045	986	1003	1077	1097	1107	1123	1118	1130	1095	1180	1124	1092	1071	1070	1077	1070	1046	992	1014	1110	1110	1100	1111	1099	1125	1139	1141	1113	1127	1156	1151	1130	1122	1086	1074
1078	1038	1034	1068	1120	1124	1124	1143	1153	1144	1146	1147	1112	1097	1100	1104	1079	1062	1054	1103	1156	1153	1144	1140	1135	1144	1160	1175	1161	1156	1168	1173	1165	1157	1127	1101
1151	1115	1075	1093	1140	1191	1220	1238	1235	1216	1173	1080	1167	1164	1157	1126	1122	1140	1169	1198	1224	1220	1199	1166	1182	1139	1221	1198	1160	1152	1187	1194	1150	1150	1174	1168
1178	1091	1014	1008	1042	986	1031	1065	1044	987	930	917	1120	1122	1165	1045	990	917	701	559	569	567	399	538	934	949	552	222	354	405	499	910	963	947	1059	1188
336	340	294	311	353	403	402	320	189	327	397	392	366	388	393	372	330	250	183	174	230	181	70	34	24	17	27	46	112	221	318	354	374	357	407	354

Figure 26. ATOVS MEAN O-B brightness temperature differences (deg C). MAY 2004
Channel: HIRS8 (Surface)
NOAA15, using all observations



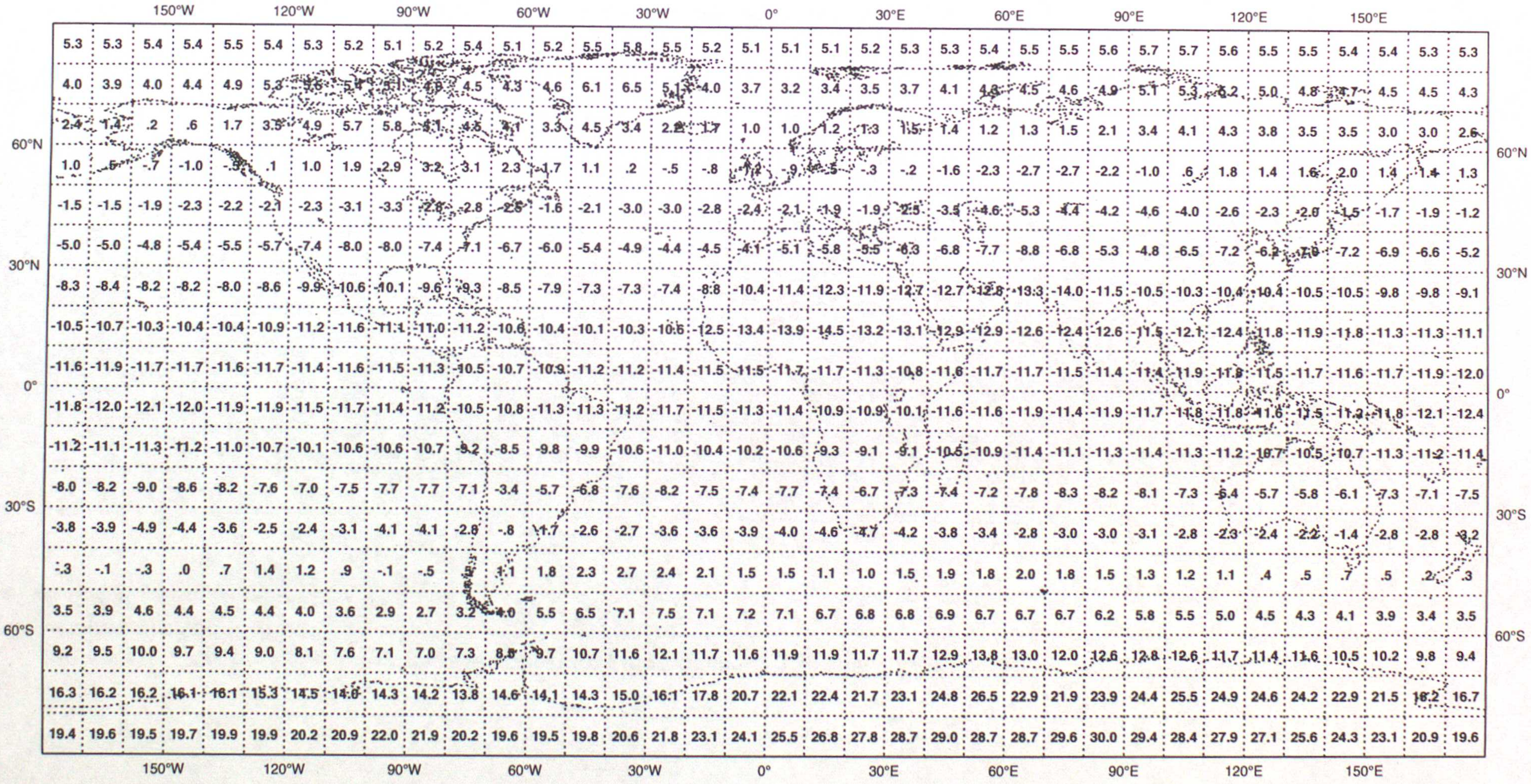
2.8	2.8	2.8	3.0	3.1	3.1	3.2	3.0	3.3	4.1	6.6	4.6	5.7	7.0	7.6	4.4	1.8	1.1	.9	.8	1.1	1.2	1.3	1.2	1.5	1.6	1.8	2.1	2.2	2.2	2.2	2.4	2.5	2.6	2.6	2.7
1.0	1.0	1.0	1.2	2.1	2.6	3.4	2.5	2.3	2.7	1.6	2.4	5.7	12.4	13.7	7.0	.3	-1.1	-4.0	-3.3	-2.5	-1.9	-.3	.6	1.3	1.4	1.6	2.1	2.5	2.1	1.7	1.4	1.2	1.1	1.1	1.0
-1.5	-4.1	-7.9	-6.6	-4.6	-.9	1.1	3.0	3.8	1.6	.6	.4	-1.6	5.1	-.7	-5.2	-6.0	-8.1	-9.2	-8.8	-8.3	-7.9	-7.2	-5.7	-4.7	-4.4	-3.4	-.8	-.9	-.4	-2.2	-1.9	-.1	-1.0	-1.8	-2.8
-5.0	-5.6	-7.6	-8.4	[illegible]	-8.3	-7.8	-6.5	-3.8	-1.9	-.9	-1.8	-3.4	-6.4	-8.9	-10.9	-12.1	-11.8	-12.1	-12.2	-11.9	-12.4	-13.7	-14.3	-15.9	-15.8	-14.1	-10.7	-8.5	-6.2	-7.3	-5.3	-2.7	-3.7	-4.1	-5.1
-8.4	-8.8	-9.4	-10.7	-12.2	-12.6	-10.8	-12.3	-13.3	-11.0	-11.8	-9.5	-8.5	-11.5	-14.9	-15.1	-14.7	-14.1	-14.3	-14.2	-14.2	-14.5	-14.9	-18.5	-20.2	-15.4	-15.0	-15.4	-15.2	-13.8	-13.6	-10.7	-7.0	-6.8	-7.3	-7.9
-16.4	-15.8	-16.0	-16.6	-17.0	-15.8	-18.7	-19.7	-20.9	-20.3	-20.7	-20.5	-19.6	-19.2	-18.8	-18.4	-18.0	-16.6	-19.0	-19.4	-19.5	-18.8	-19.7	-19.7	-21.1	-12.6	-7.9	-6.2	-13.8	-19.1	-16.2	-17.3	-17.8	-17.9	-17.2	-16.6
-21.5	-21.8	-21.7	-21.4	-20.7	-20.0	-21.8	-23.9	-24.0	-23.9	-23.9	-23.1	-22.8	-22.1	-21.8	-21.1	-22.3	-27.1	-28.0	-29.3	-31.6	-30.4	-30.0	-29.5	-29.6	-31.7	-22.1	-18.2	-17.7	-21.3	-22.6	-22.9	-23.8	-23.4	-23.1	-22.2
-23.7	-23.7	-23.2	-22.9	-22.6	-23.1	-23.7	-24.3	-22.9	-23.0	-23.6	-23.2	-23.3	-22.8	-22.5	-22.8	-27.9	-31.8	-31.8	-32.4	-30.3	-27.4	-27.8	-29.0	-27.0	-25.6	-25.4	-22.9	-23.5	-24.8	-24.2	-24.4	-25.0	-24.8	-24.7	-24.1
-23.9	-23.9	-23.9	-23.7	-23.6	-23.7	-23.8	-23.7	-23.1	-22.1	-19.4	-20.4	-21.5	-22.6	-22.8	-23.0	-23.6	-24.2	-24.3	-23.8	-23.1	-20.2	-24.0	-26.1	-25.9	-24.7	-23.9	-23.8	-24.8	-23.8	-23.5	-23.3	-23.2	-23.5	-23.8	-24.0
-24.8	-25.2	-25.5	-25.6	-25.7	-25.6	-25.2	-24.7	-24.0	-21.9	-19.4	-21.5	-23.1	-23.5	-23.7	-24.8	-24.6	-24.5	-24.4	-22.5	-21.3	-19.2	-25.1	-25.5	-25.4	-24.3	-24.0	-23.7	-23.7	-23.9	-24.0	-22.6	-21.6	-23.3	-24.3	-24.9
-25.1	-25.5	-25.3	-25.2	-25.2	-25.0	-24.4	-24.1	-23.5	-22.7	-16.5	-15.2	-20.4	-20.1	-24.3	-24.8	-24.0	-23.3	-23.0	-18.2	-16.4	-18.8	-23.5	-24.5	-24.2	-23.1	-23.2	-24.0	-24.8	-25.1	-22.8	-21.4	-22.8	-24.8	-24.8	-25.2
-22.5	-22.6	-22.7	-22.4	-22.3	-22.9	-22.5	-21.8	-21.2	-20.5	-18.8	-6.1	-15.0	-19.2	-22.5	-22.6	-22.1	-21.3	-20.8	-17.1	-13.4	-21.6	-22.6	-23.2	-22.6	-22.0	-21.7	-21.8	-22.3	-18.6	-14.6	-13.7	-14.7	-21.2	-22.5	-22.5
-18.2	-18.5	-18.6	-18.2	-18.0	-17.4	-17.9	-17.9	-17.6	-17.4	-13.3	-6.9	-14.3	-19.1	-18.7	-18.7	-18.4	-17.7	-17.5	-17.7	-16.4	-20.0	-19.6	-19.4	-18.6	-17.6	-16.9	-17.0	-17.5	-16.4	-15.4	-14.6	-9.6	-18.4	-18.7	-17.6
-13.5	-13.6	-13.2	-12.7	-12.2	-11.7	-11.8	-11.7	-11.6	-12.0	-7.9	-8.0	-12.3	-13.1	-10.9	-10.2	-9.3	-9.0	-9.2	-10.0	-10.1	-9.7	-9.4	-10.5	-10.9	-10.7	-11.1	-10.4	-10.1	-10.7	-11.6	-11.7	-11.9	-13.0	-12.5	-11.2
-8.0	-7.5	-7.0	-6.8	-7.0	-6.9	-7.1	-7.3	-7.3	-7.7	-6.9	-6.5	-5.3	-4.1	-3.0	-2.7	-2.4	-2.1	-2.0	-2.0	-2.5	-2.9	-2.9	-3.3	-3.5	-3.1	-3.9	-4.0	-3.9	-4.6	-5.1	-5.3	-5.8	-6.6	-7.8	-8.0
1.9	1.9	2.2	.8	.2	.0	-1.2	-1.5	-1.8	-1.8	-1.3	3.0	4.8	6.0	6.5	7.0	3.8	1.3	2.0	3.1	2.6	2.1	7.0	11.9	9.5	5.7	9.3	12.1	12.2	9.5	9.6	12.4	8.5	7.1	5.8	3.5
17.1	17.3	17.5	18.0	18.4	16.2	14.3	13.5	16.7	16.2	15.5	18.7	14.8	14.8	14.8	17.7	23.5	33.1	37.0	36.0	31.1	36.1	43.3	48.9	38.1	34.4	41.4	45.3	50.2	50.6	50.9	51.1	48.2	42.5	26.9	17.8
25.6	25.3	24.4	27.6	29.3	29.4	29.4	32.5	36.3	36.0	30.9	28.2	28.4	29.8	32.6	37.8	41.8	45.5	48.6	51.2	51.8	52.9	54.1	53.5	52.9	53.3	53.8	54.8	54.1	53.7	51.7	48.2	44.7	40.9	31.2	25.7

Figure 27. ATOVS SD O-B brightness temperature differences (deg C). MAY 2004
Channel: HIRS8 (Surface)
NOAA15, using all observations



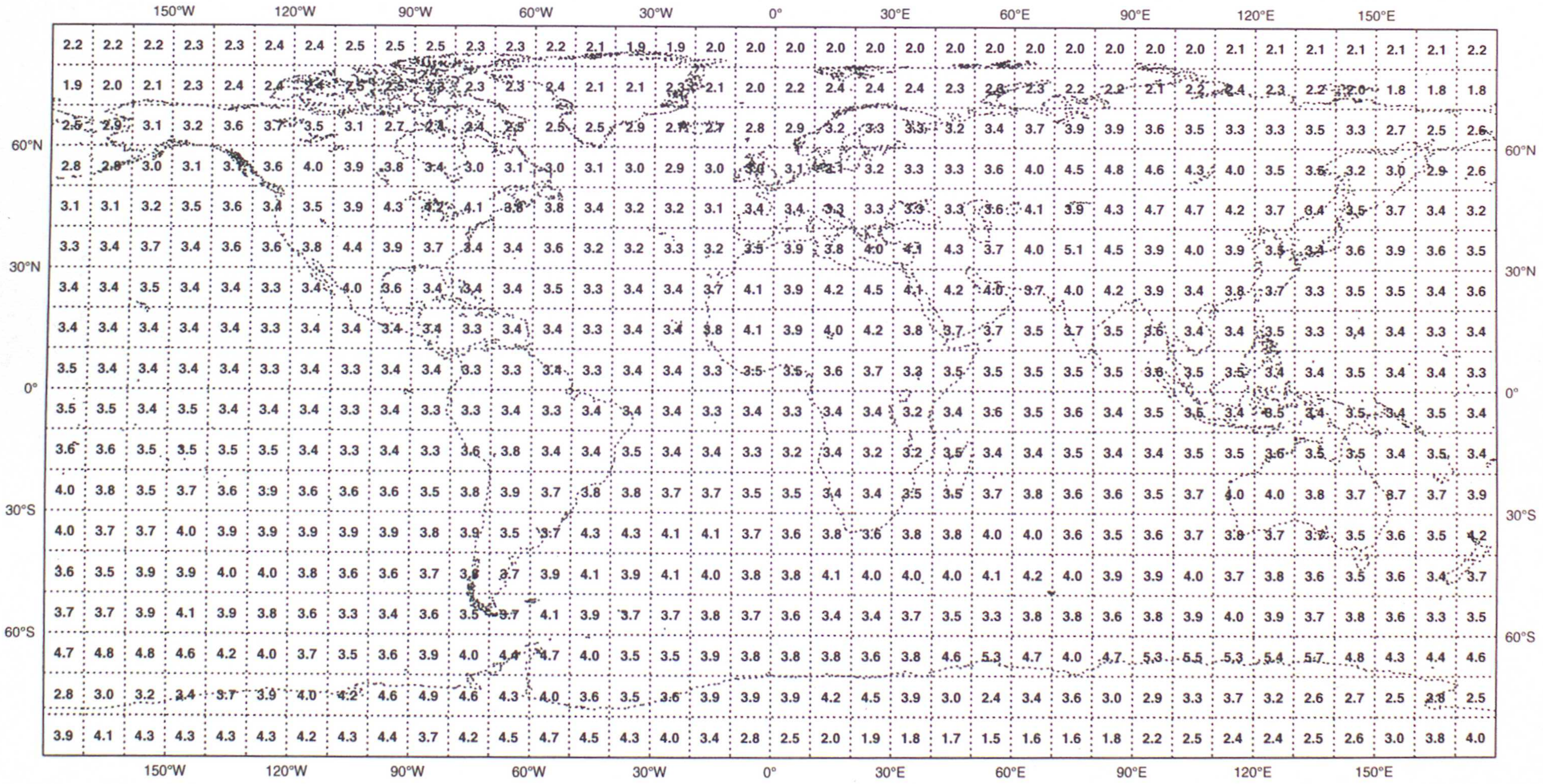
4.4	4.2	4.1	4.2	4.2	4.3	4.3	4.3	4.2	4.5	5.5	4.6	5.2	5.8	6.1	4.6	2.9	2.4	2.3	2.3	2.5	2.6	2.4	2.4	2.8	3.0	3.1	3.2	3.5	3.6	3.7	3.8	4.0	4.2	4.3	4.3
3.2	3.3	3.4	3.4	3.8	3.6	3.8	3.1	3.0	3.7	3.4	4.5	6.0	5.0	4.8	5.5	1.7	1.8	2.7	3.7	3.3	2.8	1.4	2.8	2.8	3.0	3.0	3.1	3.3	3.5	3.5	3.2	3.0	3.1	3.1	3.1
1.6	4.0	5.3	6.2	6.5	5.9	5.3	4.5	3.5	2.7	2.4	2.4	2.0	5.6	7.5	5.6	3.7	1.7	1.8	3.6	4.6	4.8	5.9	6.5	7.0	7.3	6.2	5.2	5.0	4.9	5.5	5.9	4.8	4.3	3.8	3.6
1.7	1.9	1.5	1.0	3.6	4.7	5.6	6.1	6.4	5.1	4.1	3.7	2.6	2.3	1.4	1.0	1.0	2.0	2.2	2.7	3.2	3.7	4.2	4.3	5.4	6.4	6.6	6.9	5.7	5.8	5.0	4.7	2.6	2.7	1.9	1.0
2.1	1.7	1.7	1.8	1.5	2.4	3.9	4.3	5.3	5.6	5.3	3.9	4.6	4.3	1.8	1.4	1.2	2.9	3.8	3.6	3.0	2.4	3.7	4.1	4.9	5.3	5.9	6.6	6.2	5.3	4.5	6.8	3.1	2.6	2.3	2.1
2.2	2.3	2.3	2.0	1.6	1.8	5.0	6.2	4.1	3.9	3.1	1.7	1.5	1.3	1.1	1.2	1.3	4.2	5.2	2.8	3.3	4.8	7.2	4.7	6.1	11.4	10.5	6.5	6.4	4.6	2.9	3.3	3.2	2.8	2.5	2.2
1.8	1.7	1.5	1.4	1.1	1.4	2.7	4.5	2.9	1.8	1.3	1.4	1.5	1.3	1.1	1.0	4.1	5.7	5.2	5.1	5.3	5.2	5.4	5.6	3.6	4.5	9.0	7.1	4.2	3.0	2.4	2.0	2.0	1.7	1.6	1.8
1.5	1.5	1.5	1.3	1.4	1.4	1.8	2.2	2.9	2.0	1.5	1.7	1.5	1.3	1.2	1.1	5.8	4.8	4.6	4.6	5.7	5.8	4.3	3.2	2.6	3.6	2.7	2.5	2.0	1.5	1.6	1.6	1.4	1.5	1.5	1.5
1.7	1.6	1.7	1.7	1.7	1.7	1.6	1.7	1.6	1.6	2.3	1.8	1.8	1.6	1.6	1.5	1.5	2.0	2.3	3.5	3.4	2.9	3.0	1.6	1.9	2.0	1.8	2.1	1.8	2.0	2.0	1.9	1.9	1.8	1.8	1.7
1.7	1.6	1.5	1.5	1.3	1.1	1.1	1.1	1.3	1.8	2.9	1.7	2.2	2.1	2.1	1.5	1.3	1.1	1.2	2.5	3.1	2.9	1.7	1.9	1.8	1.9	1.7	1.8	2.0	2.0	2.4	2.3	2.3	1.9	1.9	1.6
2.1	1.8	1.6	1.4	1.3	1.4	1.3	1.0	1.1	1.1	6.7	7.3	3.3	2.6	1.9	1.0	1.1	1.2	1.3	4.0	2.9	3.6	3.8	1.5	1.8	1.8	1.5	1.5	1.5	1.5	3.5	3.8	2.8	1.4	1.4	1.7
1.8	2.0	2.0	2.0	1.8	1.7	1.4	1.4	1.1	.9	3.6	8.4	3.3	3.7	1.8	1.6	1.5	1.0	.9	3.8	5.1	4.1	3.3	1.3	1.3	1.5	1.6	1.5	1.5	5.8	4.5	4.3	4.9	4.9	1.6	1.6
1.5	1.7	1.6	1.8	1.7	1.8	2.0	1.9	1.9	1.7	6.1	4.8	4.0	1.7	1.7	2.0	2.0	2.0	1.7	2.1	5.1	2.3	1.9	1.7	1.9	2.0	1.9	2.1	2.1	3.8	3.6	3.9	4.5	4.2	1.9	8.1
1.8	1.7	1.7	1.7	1.8	1.8	1.8	1.7	1.6	1.5	6.9	5.4	2.0	2.4	2.9	3.2	3.1	3.0	3.0	3.9	3.8	3.1	3.4	3.8	3.7	3.2	2.1	2.2	2.4	2.0	1.9	2.0	2.3	2.0	2.9	2.9
1.8	2.1	2.5	2.4	2.0	1.5	1.4	1.3	1.3	1.4	2.7	2.4	2.3	2.3	1.6	1.4	1.0	.9	1.1	.9	1.0	1.2	1.1	1.1	1.0	1.2	1.8	1.6	1.2	1.4	1.6	1.6	1.8	2.0	1.8	1.4
6.8	6.3	6.2	4.9	4.4	4.4	3.2	2.7	2.2	2.6	3.0	7.7	5.7	4.8	4.6	5.4	5.0	3.1	3.7	4.8	4.6	5.5	12.2	16.2	12.5	8.3	12.0	15.0	16.7	13.5	14.4	17.1	13.5	10.2	8.2	8.2
4.8	4.8	6.4	9.2	10.8	10.6	10.5	11.3	12.2	12.6	11.0	8.3	6.1	6.6	7.0	10.6	12.9	13.2	13.0	13.7	14.0	11.0	8.8	5.9	8.4	8.7	6.9	6.0	5.7	7.9	7.6	5.5	6.4	7.6	11.0	5.1
11.3	10.8	10.7	10.6	10.4	10.1	9.3	9.8	9.7	7.2	8.8	9.6	10.6	10.0	9.6	7.9	7.1	5.9	5.1	3.9	3.4	3.8	4.2	4.4	5.0	4.8	4.5	5.1	6.4	6.9	7.0	7.5	7.6	8.7	12.1	11.8

Figure 28. ATOVS MEAN O-B brightness temperature differences (deg C). MAY 2004
Channel: HIRS15 (700 hPa)
NOAA15, using all observations



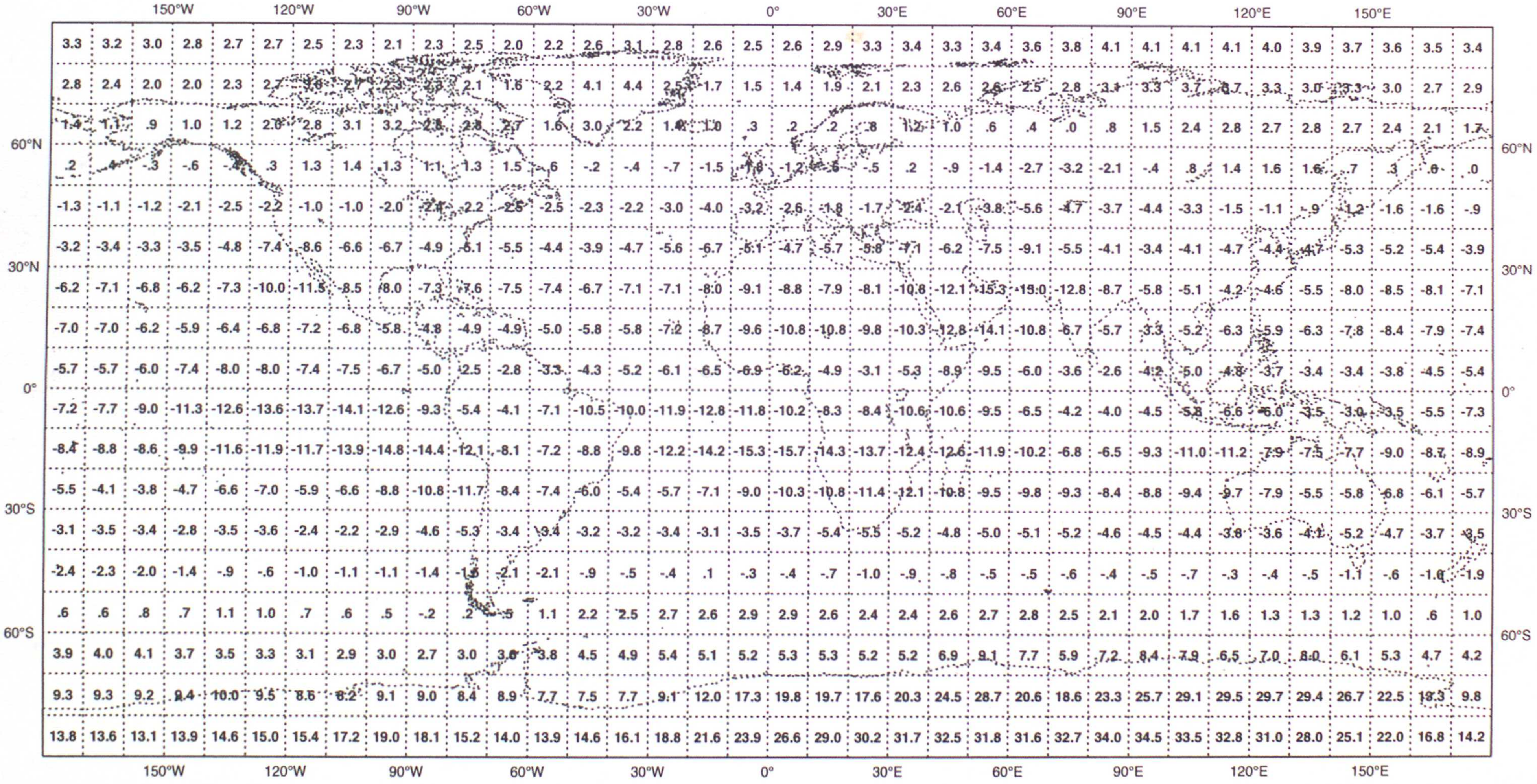
5.3	5.3	5.4	5.4	5.5	5.4	5.3	5.2	5.1	5.2	5.4	5.1	5.2	5.5	5.8	5.5	5.2	5.1	5.1	5.1	5.2	5.3	5.3	5.4	5.5	5.5	5.6	5.7	5.7	5.6	5.5	5.5	5.4	5.4	5.3	5.3
4.0	3.9	4.0	4.4	4.9	5.3	5.6	5.4	5.1	4.9	4.5	4.3	4.6	6.1	6.5	5.1	4.0	3.7	3.2	3.4	3.5	3.7	4.1	4.8	4.5	4.6	4.9	5.1	5.3	6.2	5.0	4.8	4.7	4.5	4.5	4.3
2.4	1.4	.2	.6	1.7	3.5	4.9	5.7	5.8	5.1	4.5	4.1	3.3	4.5	3.4	2.2	1.7	1.0	1.0	1.2	1.3	1.5	1.4	1.2	1.3	1.5	2.1	3.4	4.1	4.3	3.8	3.5	3.5	3.0	3.0	2.6
1.0	-.5	-.7	-1.0	-.5	.1	1.0	1.9	2.9	3.2	3.1	2.3	-1.7	1.1	.2	-.5	-.8	-1.2	-.9	-.5	-.3	-.2	-1.6	-2.3	-2.7	-2.7	-2.2	-1.0	.6	1.8	1.4	1.6	2.0	1.4	1.4	1.3
-1.5	-1.5	-1.9	-2.3	-2.2	-2.1	-2.3	-3.1	-3.3	-2.8	-2.8	-2.5	-1.6	-2.1	-3.0	-3.0	-2.8	-2.4	-2.1	-1.9	-1.9	-2.5	-3.5	-4.6	-5.3	-4.4	-4.2	-4.6	-4.0	-2.6	-2.3	-2.0	-1.5	-1.7	-1.9	-1.2
-5.0	-5.0	-4.8	-5.4	-5.5	-5.7	-7.4	-8.0	-8.0	-7.4	-7.1	-6.7	-6.0	-5.4	-4.9	-4.4	-4.5	-4.1	-5.1	-5.8	-5.5	-6.3	-6.8	-7.7	-8.8	-6.8	-5.3	-4.8	-6.5	-7.2	-6.2	-7.0	-7.2	-6.9	-6.6	-5.2
-8.3	-8.4	-8.2	-8.2	-8.0	-8.6	-9.9	-10.6	-10.1	-9.6	-9.3	-8.5	-7.9	-7.3	-7.3	-7.4	-8.8	-10.4	-11.4	-12.3	-11.9	-12.7	-12.7	-12.8	-13.3	-14.0	-11.5	-10.5	-10.3	-10.4	-10.4	-10.5	-10.5	-9.8	-9.8	-9.1
-10.5	-10.7	-10.3	-10.4	-10.4	-10.9	-11.2	-11.6	-11.1	-11.0	-11.2	-10.6	-10.4	-10.1	-10.3	-10.6	-12.5	-13.4	-13.9	-14.5	-13.2	-13.1	-12.9	-12.9	-12.6	-12.4	-12.6	-11.5	-12.1	-12.4	-11.8	-11.9	-11.8	-11.3	-11.3	-11.1
-11.6	-11.9	-11.7	-11.7	-11.6	-11.7	-11.4	-11.6	-11.5	-11.3	-10.5	-10.7	-10.9	-11.2	-11.2	-11.4	-11.5	-11.5	-11.7	-11.7	-11.3	-10.8	-11.6	-11.7	-11.7	-11.5	-11.4	-11.4	-11.9	-11.8	-11.5	-11.7	-11.6	-11.7	-11.9	-12.0
-11.8	-12.0	-12.1	-12.0	-11.9	-11.9	-11.5	-11.7	-11.4	-11.2	-10.5	-10.8	-11.3	-11.3	-11.2	-11.7	-11.5	-11.3	-11.4	-10.9	-10.9	-10.1	-11.6	-11.6	-11.9	-11.4	-11.9	-11.7	-11.8	-11.8	-11.6	-11.5	-11.2	-11.8	-12.1	-12.4
-11.2	-11.1	-11.3	-11.2	-11.0	-10.7	-10.1	-10.6	-10.6	-10.7	-9.2	-8.5	-9.8	-9.9	-10.6	-11.0	-10.4	-10.2	-10.6	-9.3	-9.1	-9.1	-10.5	-10.9	-11.4	-11.1	-11.3	-11.4	-11.3	-11.2	-10.7	-10.5	-10.7	-11.3	-11.2	-11.4
-8.0	-8.2	-9.0	-8.6	-8.2	-7.6	-7.0	-7.5	-7.7	-7.7	-7.1	-3.4	-5.7	-6.8	-7.6	-8.2	-7.5	-7.4	-7.7	-7.4	-6.7	-7.3	-7.4	-7.2	-7.8	-8.3	-8.2	-8.1	-7.3	-6.4	-5.7	-5.8	-6.1	-7.3	-7.1	-7.5
-3.8	-3.9	-4.9	-4.4	-3.6	-2.5	-2.4	-3.1	-4.1	-4.1	-2.8	-.8	-1.7	-2.6	-2.7	-3.6	-3.6	-3.9	-4.0	-4.6	-4.7	-4.2	-3.8	-3.4	-2.8	-3.0	-3.0	-3.1	-2.8	-2.3	-2.4	-2.2	-1.4	-2.8	-2.8	-3.2
-.3	-.1	-.3	.0	.7	1.4	1.2	.9	-.1	-.5	.5	1.1	1.8	2.3	2.7	2.4	2.1	1.5	1.5	1.1	1.0	1.5	1.9	1.8	2.0	1.8	1.5	1.3	1.2	1.1	.4	.5	.7	.5	.2	.3
3.5	3.9	4.6	4.4	4.5	4.4	4.0	3.6	2.9	2.7	3.2	4.0	5.5	6.5	7.1	7.5	7.1	7.2	7.1	6.7	6.8	6.8	6.9	6.7	6.7	6.7	6.2	5.8	5.5	5.0	4.5	4.3	4.1	3.9	3.4	3.5
9.2	9.5	10.0	9.7	9.4	9.0	8.1	7.6	7.1	7.0	7.3	8.5	9.7	10.7	11.6	12.1	11.7	11.6	11.9	11.9	11.7	11.7	12.9	13.8	13.0	12.0	12.6	12.8	12.6	11.7	11.4	11.6	10.5	10.2	9.8	9.4
16.3	16.2	16.2	16.1	16.1	15.3	14.5	14.0	14.3	14.2	13.8	14.6	14.1	14.3	15.0	16.1	17.8	20.7	22.1	22.4	21.7	23.1	24.8	26.5	22.9	21.9	23.9	24.4	25.5	24.9	24.6	24.2	22.9	21.5	18.2	16.7
19.4	19.6	19.5	19.7	19.9	19.9	20.2	20.9	22.0	21.9	20.2	19.6	19.5	19.8	20.6	21.8	23.1	24.1	25.5	26.8	27.8	28.7	29.0	28.7	28.7	29.6	30.0	29.4	28.4	27.9	27.1	25.6	24.3	23.1	20.9	19.6

Figure 29. ATOVS SD O-B brightness temperature differences (deg C). MAY 2004
Channel: HIRS15 (700 hPa)
NOAA15, using all observations



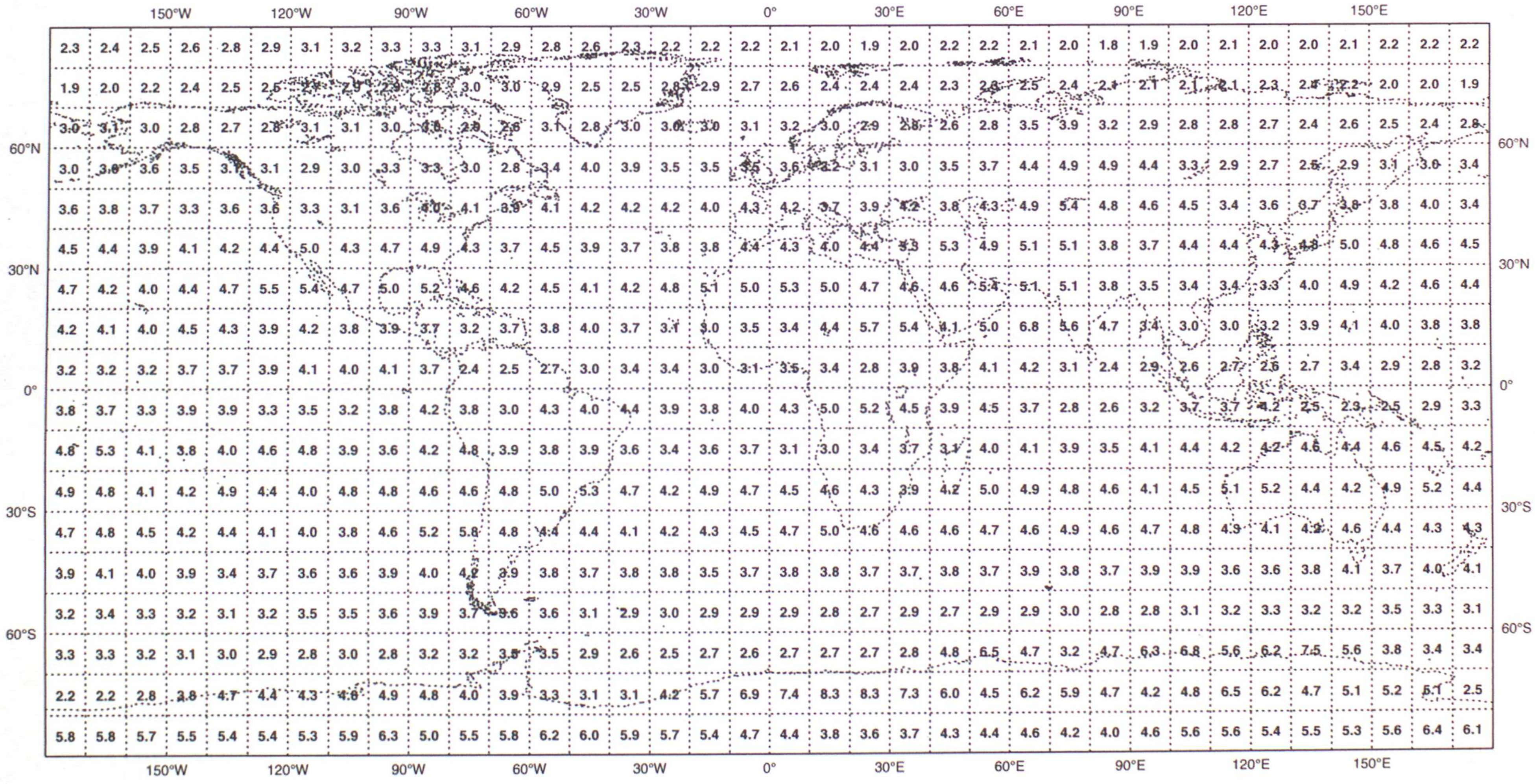
2.2	2.2	2.2	2.3	2.3	2.4	2.4	2.5	2.5	2.5	2.3	2.3	2.2	2.1	1.9	1.9	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.1	2.1	2.1	2.1	2.1	2.1	2.2
1.9	2.0	2.1	2.3	2.4	2.4	2.4	2.5	2.5	2.3	2.3	2.3	2.4	2.1	2.1	2.3	2.1	2.0	2.2	2.4	2.4	2.4	2.3	2.8	2.3	2.2	2.2	2.1	2.2	2.4	2.3	2.2	2.0	1.8	1.8	1.8
2.5	2.9	3.1	3.2	3.6	3.7	3.5	3.1	2.7	2.4	2.4	2.5	2.5	2.5	2.9	2.7	2.7	2.8	2.9	3.2	3.3	3.3	3.2	3.4	3.7	3.9	3.9	3.6	3.5	3.3	3.3	3.5	3.3	2.7	2.5	2.6
2.8	2.8	3.0	3.1	3.1	3.6	4.0	3.9	3.8	3.4	3.0	3.1	3.0	3.1	3.0	2.9	3.0	3.0	3.1	2.1	3.2	3.3	3.3	3.6	4.0	4.5	4.8	4.6	4.3	4.0	3.5	3.6	3.2	3.0	2.9	2.6
3.1	3.1	3.2	3.5	3.6	3.4	3.5	3.9	4.3	4.2	4.1	3.8	3.8	3.4	3.2	3.2	3.1	3.4	3.4	3.3	3.3	3.3	3.3	3.6	4.1	3.9	4.3	4.7	4.7	4.2	3.7	3.4	3.5	3.7	3.4	3.2
3.3	3.4	3.7	3.4	3.6	3.6	3.8	4.4	3.9	3.7	3.4	3.4	3.6	3.2	3.2	3.3	3.2	3.5	3.9	3.8	4.0	4.1	4.3	3.7	4.0	5.1	4.5	3.9	4.0	3.9	3.5	3.4	3.6	3.9	3.6	3.5
3.4	3.4	3.5	3.4	3.4	3.3	3.4	4.0	3.6	3.4	3.4	3.4	3.5	3.3	3.4	3.4	3.7	4.1	3.9	4.2	4.5	4.1	4.2	4.0	3.7	4.0	4.2	3.9	3.4	3.8	3.7	3.3	3.5	3.5	3.4	3.6
3.4	3.4	3.4	3.4	3.4	3.3	3.4	3.4	3.4	3.4	3.3	3.4	3.4	3.3	3.4	3.4	3.8	4.1	3.9	4.0	4.2	3.8	3.7	3.7	3.5	3.7	3.5	3.6	3.4	3.4	3.5	3.3	3.4	3.4	3.3	3.4
3.5	3.4	3.4	3.4	3.4	3.3	3.4	3.3	3.4	3.4	3.3	3.3	3.4	3.3	3.4	3.4	3.3	3.5	3.5	3.6	3.7	3.3	3.5	3.5	3.5	3.5	3.5	3.6	3.5	3.5	3.4	3.4	3.5	3.4	3.4	3.3
3.5	3.5	3.4	3.5	3.4	3.4	3.4	3.3	3.4	3.3	3.3	3.4	3.3	3.4	3.4	3.4	3.3	3.4	3.3	3.4	3.4	3.2	3.4	3.6	3.5	3.6	3.4	3.5	3.5	3.4	3.5	3.4	3.5	3.4	3.5	3.4
3.6	3.6	3.5	3.5	3.5	3.5	3.4	3.3	3.4	3.3	3.6	3.8	3.4	3.4	3.5	3.4	3.4	3.3	3.2	3.4	3.2	3.2	3.5	3.4	3.4	3.5	3.4	3.4	3.5	3.5	3.6	3.5	3.5	3.4	3.5	3.4
4.0	3.8	3.5	3.7	3.6	3.9	3.6	3.6	3.6	3.5	3.8	3.9	3.7	3.8	3.8	3.7	3.7	3.5	3.5	3.4	3.4	3.5	3.5	3.7	3.8	3.6	3.6	3.5	3.7	4.0	4.0	3.8	3.7	3.7	3.7	3.9
4.0	3.7	3.7	4.0	3.9	3.9	3.9	3.9	3.9	3.8	3.9	3.5	3.7	4.3	4.3	4.1	4.1	3.7	3.6	3.8	3.6	3.8	3.8	4.0	4.0	3.6	3.5	3.6	3.7	3.8	3.7	3.7	3.5	3.6	3.5	4.2
3.6	3.5	3.9	3.9	4.0	4.0	3.8	3.6	3.6	3.7	3.8	3.7	3.9	4.1	3.9	4.1	4.0	3.8	3.8	4.1	4.0	4.0	4.0	4.1	4.2	4.0	3.9	3.9	4.0	3.7	3.8	3.6	3.5	3.6	3.4	3.7
3.7	3.7	3.9	4.1	3.9	3.8	3.6	3.3	3.4	3.6	3.5	3.7	4.1	3.9	3.7	3.7	3.8	3.7	3.6	3.4	3.4	3.7	3.5	3.3	3.8	3.8	3.6	3.8	3.9	4.0	3.9	3.7	3.8	3.6	3.3	3.5
4.7	4.8	4.8	4.6	4.2	4.0	3.7	3.5	3.6	3.9	4.0	4.4	4.7	4.0	3.5	3.5	3.9	3.8	3.8	3.8	3.6	3.8	4.6	5.3	4.7	4.0	4.7	5.3	5.5	5.3	5.4	5.7	4.8	4.3	4.4	4.6
2.8	3.0	3.2	3.4	3.7	3.9	4.0	4.2	4.6	4.9	4.6	4.3	4.0	3.6	3.5	3.6	3.9	3.9	3.9	4.2	4.5	3.9	3.0	2.4	3.4	3.6	3.0	2.9	3.3	3.7	3.2	2.6	2.7	2.5	2.8	2.5
3.9	4.1	4.3	4.3	4.3	4.3	4.2	4.3	4.4	3.7	4.2	4.5	4.7	4.5	4.3	4.0	3.4	2.8	2.5	2.0	1.9	1.8	1.7	1.5	1.6	1.6	1.8	2.2	2.5	2.4	2.4	2.5	2.6	3.0	3.8	4.0

Figure 30. ATOVS MEAN O-B brightness temperature differences (deg C). MAY 2004
Channel: HIRS11 (500 - 700 hPa)
NOAA15, using all observations



3.3	3.2	3.0	2.8	2.7	2.7	2.5	2.3	2.1	2.3	2.5	2.0	2.2	2.6	3.1	2.8	2.6	2.5	2.6	2.9	3.3	3.4	3.3	3.4	3.6	3.8	4.1	4.1	4.1	4.1	4.0	3.9	3.7	3.6	3.5	3.4
2.8	2.4	2.0	2.0	2.3	2.7	3.6	2.7	2.3	2.3	2.1	1.6	2.2	4.1	4.4	2.5	1.7	1.5	1.4	1.9	2.1	2.3	2.6	2.6	2.5	2.8	3.1	3.3	3.7	3.7	3.3	3.0	3.3	3.0	2.7	2.9
1.4	1.1	.9	1.0	1.2	2.0	2.8	3.1	3.2	2.8	2.8	2.7	1.6	3.0	2.2	1.4	1.0	.3	.2	.2	.8	1.2	1.0	.6	.4	.0	.8	1.5	2.4	2.8	2.7	2.8	2.7	2.4	2.1	1.7
.2	.4	-.3	-.6	-.4	.3	1.3	1.4	1.3	1.1	1.3	1.5	.6	-.2	-.4	-.7	-1.5	-1.8	-1.2	-.6	-.5	.2	-.9	-1.4	-2.7	-3.2	-2.1	-.4	.8	1.4	1.6	1.6	.7	.3	.6	.0
-1.3	-1.1	-1.2	-2.1	-2.5	-2.2	-1.0	-1.0	-2.0	-2.4	-2.2	-2.5	-2.5	-2.3	-2.2	-3.0	-4.0	-3.2	-2.6	-1.8	-1.7	-2.4	-2.1	-3.8	-5.6	-4.7	-3.7	-4.4	-3.3	-1.5	-1.1	-.9	-1.2	-1.6	-1.6	-.9
-3.2	-3.4	-3.3	-3.5	-4.8	-7.4	-8.6	-6.6	-6.7	-4.9	-5.1	-5.5	-4.4	-3.9	-4.7	-5.6	-6.7	-5.1	-4.7	-5.7	-5.8	-7.1	-6.2	-7.5	-9.1	-5.5	-4.1	-3.4	-4.1	-4.7	-4.4	-4.7	-5.3	-5.2	-5.4	-3.9
-6.2	-7.1	-6.8	-6.2	-7.3	-10.0	-11.5	-8.5	-8.0	-7.3	-7.6	-7.5	-7.4	-6.7	-7.1	-7.1	-8.0	-9.1	-8.8	-7.9	-8.1	-10.8	-12.1	-15.3	-15.0	-12.8	-8.7	-5.8	-5.1	-4.2	-4.6	-5.5	-8.0	-8.5	-8.1	-7.1
-7.0	-7.0	-6.2	-5.9	-6.4	-6.8	-7.2	-6.8	-5.8	-4.8	-4.9	-4.9	-5.0	-5.8	-5.8	-7.2	-8.7	-9.6	-10.8	-10.8	-9.8	-10.3	-12.8	-14.1	-10.8	-6.7	-5.7	-3.3	-5.2	-6.3	-5.9	-6.3	-7.8	-8.4	-7.9	-7.4
-5.7	-5.7	-6.0	-7.4	-8.0	-8.0	-7.4	-7.5	-6.7	-5.0	-2.5	-2.8	-3.3	-4.3	-5.2	-6.1	-6.5	-6.9	-6.2	-4.9	-3.1	-5.3	-8.9	-9.5	-6.0	-3.6	-2.6	-4.2	-5.0	-4.8	-3.7	-3.4	-3.4	-3.8	-4.5	-5.4
-7.2	-7.7	-9.0	-11.3	-12.6	-13.6	-13.7	-14.1	-12.6	-9.3	-5.4	-4.1	-7.1	-10.5	-10.0	-11.9	-12.8	-11.8	-10.2	-8.3	-8.4	-10.6	-10.6	-9.5	-6.5	-4.2	-4.0	-4.5	-5.8	-6.6	-6.0	-3.5	-3.0	-3.5	-5.5	-7.3
-8.4	-8.8	-8.6	-9.9	-11.6	-11.9	-11.7	-13.9	-14.8	-14.4	-12.1	-8.1	-7.2	-8.8	-9.8	-12.2	-14.2	-15.3	-15.7	-14.3	-13.7	-12.4	-12.6	-11.9	-10.2	-6.8	-6.5	-9.3	-11.0	-11.2	-7.9	-7.5	-7.7	-9.0	-8.7	-8.9
-5.5	-4.1	-3.8	-4.7	-6.6	-7.0	-5.9	-6.6	-8.8	-10.8	-11.7	-8.4	-7.4	-6.0	-5.4	-5.7	-7.1	-9.0	-10.3	-10.8	-11.4	-12.1	-10.8	-9.5	-9.8	-9.3	-8.4	-8.8	-9.4	-9.7	-7.9	-5.5	-5.8	-6.8	-6.1	-5.7
-3.1	-3.5	-3.4	-2.8	-3.5	-3.6	-2.4	-2.2	-2.9	-4.6	-5.3	-3.4	-3.4	-3.2	-3.2	-3.4	-3.1	-3.5	-3.7	-5.4	-5.5	-5.2	-4.8	-5.0	-5.1	-5.2	-4.6	-4.5	-4.4	-3.8	-3.6	-4.1	-5.2	-4.7	-3.7	-3.5
-2.4	-2.3	-2.0	-1.4	-.9	-.6	-1.0	-1.1	-1.1	-1.4	-1.5	-2.1	-2.1	-.9	-.5	-.4	.1	-.3	-.4	-.7	-1.0	-.9	-.8	-.5	-.5	-.6	-.4	-.5	-.7	-.3	-.4	-.5	-1.1	-.6	-1.6	-1.9
.6	.6	.8	.7	1.1	1.0	.7	.6	.5	-.2	.2	.5	1.1	2.2	2.5	2.7	2.6	2.9	2.9	2.6	2.4	2.4	2.6	2.7	2.8	2.5	2.1	2.0	1.7	1.6	1.3	1.3	1.2	1.0	.6	1.0
3.9	4.0	4.1	3.7	3.5	3.3	3.1	2.9	3.0	2.7	3.0	3.6	3.8	4.5	4.9	5.4	5.1	5.2	5.3	5.3	5.2	5.2	6.9	9.1	7.7	5.9	7.2	8.4	7.9	6.5	7.0	8.0	6.1	5.3	4.7	4.2
9.3	9.3	9.2	9.4	10.0	9.5	8.6	8.2	9.1	9.0	8.4	8.9	7.7	7.5	7.7	9.1	12.0	17.3	19.8	19.7	17.6	20.3	24.5	28.7	20.6	18.6	23.3	25.7	29.1	29.5	29.7	29.4	26.7	22.5	18.3	9.8
13.8	13.6	13.1	13.9	14.6	15.0	15.4	17.2	19.0	18.1	15.2	14.0	13.9	14.6	16.1	18.8	21.6	23.9	26.6	29.0	30.2	31.7	32.5	31.8	31.6	32.7	34.0	34.5	33.5	32.8	31.0	28.0	25.1	22.0	16.8	14.2

Figure 31. ATOVS SD O-B brightness temperature differences (deg C). MAY 2004
Channel: HIRS11 (500 - 700 hPa)
NOAA15, using all observations



2.3	2.4	2.5	2.6	2.8	2.9	3.1	3.2	3.3	3.3	3.1	2.9	2.8	2.6	2.3	2.2	2.2	2.2	2.1	2.0	1.9	2.0	2.2	2.2	2.1	2.0	1.8	1.9	2.0	2.1	2.0	2.0	2.1	2.2	2.2	2.2
1.9	2.0	2.2	2.4	2.5	2.5	2.7	2.9	2.9	2.8	3.0	3.0	2.9	2.5	2.5	2.8	2.9	2.7	2.6	2.4	2.4	2.4	2.3	2.8	2.5	2.4	2.4	2.1	2.1	2.1	2.3	2.4	2.2	2.0	2.0	1.9
3.0	3.1	3.0	2.8	2.7	2.8	3.1	3.1	3.0	3.0	2.9	2.6	3.1	2.8	3.0	3.0	3.0	3.1	3.2	3.0	2.9	2.8	2.6	2.8	3.5	3.9	3.2	2.9	2.8	2.8	2.7	2.4	2.6	2.5	2.4	2.8
3.0	3.6	3.6	3.5	3.1	3.1	2.9	3.0	3.3	3.3	3.0	2.8	3.4	4.0	3.9	3.5	3.5	3.5	3.6	2.2	3.1	3.0	3.5	3.7	4.4	4.9	4.9	4.4	3.3	2.9	2.7	2.5	2.9	3.1	3.0	3.4
3.6	3.8	3.7	3.3	3.6	3.6	3.3	3.1	3.6	4.0	4.1	3.9	4.1	4.2	4.2	4.2	4.0	4.3	4.2	3.7	3.9	4.2	3.8	4.3	4.9	5.4	4.8	4.6	4.5	3.4	3.6	3.7	3.8	3.8	4.0	3.4
4.5	4.4	3.9	4.1	4.2	4.4	5.0	4.3	4.7	4.9	4.3	3.7	4.5	3.9	3.7	3.8	3.8	4.4	4.3	4.0	4.4	5.3	5.3	4.9	5.1	5.1	3.8	3.7	4.4	4.4	4.3	4.8	5.0	4.8	4.6	4.5
4.7	4.2	4.0	4.4	4.7	5.5	5.4	4.7	5.0	5.2	4.6	4.2	4.5	4.1	4.2	4.8	5.1	5.0	5.3	5.0	4.7	4.6	4.6	5.4	5.1	5.1	3.8	3.5	3.4	3.4	3.3	4.0	4.9	4.2	4.6	4.4
4.2	4.1	4.0	4.5	4.3	3.9	4.2	3.8	3.9	3.7	3.2	3.7	3.8	4.0	3.7	3.1	3.0	3.5	3.4	4.4	5.7	5.4	4.1	5.0	6.8	5.6	4.7	3.4	3.0	3.0	3.2	3.9	4.1	4.0	3.8	3.8
3.2	3.2	3.2	3.7	3.7	3.9	4.1	4.0	4.1	3.7	2.4	2.5	2.7	3.0	3.4	3.4	3.0	3.1	3.5	3.4	2.8	3.9	3.8	4.1	4.2	3.1	2.4	2.9	2.6	2.7	2.6	2.7	3.4	2.9	2.8	3.2
3.8	3.7	3.3	3.9	3.9	3.3	3.5	3.2	3.8	4.2	3.8	3.0	4.3	4.0	4.4	3.9	3.8	4.0	4.3	5.0	5.2	4.5	3.9	4.5	3.7	2.8	2.6	3.2	3.7	3.7	4.2	2.5	2.3	2.5	2.9	3.3
4.8	5.3	4.1	3.8	4.0	4.6	4.8	3.9	3.6	4.2	4.8	3.9	3.8	3.9	3.6	3.4	3.6	3.7	3.1	3.0	3.4	3.7	3.1	4.0	4.1	3.9	3.5	4.1	4.4	4.2	4.2	4.6	4.4	4.6	4.5	4.2
4.9	4.8	4.1	4.2	4.9	4.4	4.0	4.8	4.8	4.6	4.6	4.8	5.0	5.3	4.7	4.2	4.9	4.7	4.5	4.6	4.3	3.9	4.2	5.0	4.9	4.8	4.6	4.1	4.5	5.1	5.2	4.4	4.2	4.9	5.2	4.4
4.7	4.8	4.5	4.2	4.4	4.1	4.0	3.8	4.6	5.2	5.8	4.8	4.4	4.4	4.1	4.2	4.3	4.5	4.7	5.0	4.6	4.6	4.6	4.7	4.6	4.9	4.6	4.7	4.8	4.9	4.1	4.2	4.6	4.4	4.3	4.3
3.9	4.1	4.0	3.9	3.4	3.7	3.6	3.6	3.9	4.0	4.2	3.9	3.8	3.7	3.8	3.8	3.5	3.7	3.8	3.8	3.7	3.7	3.8	3.7	3.9	3.8	3.7	3.9	3.9	3.6	3.6	3.8	4.1	3.7	4.0	4.1
3.2	3.4	3.3	3.2	3.1	3.2	3.5	3.5	3.6	3.9	3.7	3.6	3.6	3.1	2.9	3.0	2.9	2.9	2.9	2.8	2.7	2.9	2.7	2.9	2.9	3.0	2.8	2.8	3.1	3.2	3.3	3.2	3.2	3.5	3.3	3.1
3.3	3.3	3.2	3.1	3.0	2.9	2.8	3.0	2.8	3.2	3.2	3.5	3.5	2.9	2.6	2.5	2.7	2.6	2.7	2.7	2.7	2.8	4.8	6.5	4.7	3.2	4.7	6.3	6.8	5.6	6.2	7.5	5.6	3.8	3.4	3.4
2.2	2.2	2.8	3.8	4.7	4.4	4.3	4.8	4.9	4.8	4.0	3.9	3.3	3.1	3.1	4.2	5.7	6.9	7.4	8.3	8.3	7.3	6.0	4.5	6.2	5.9	4.7	4.2	4.8	6.5	6.2	4.7	5.1	5.2	5.1	2.5
5.8	5.8	5.7	5.5	5.4	5.4	5.3	5.9	6.3	5.0	5.5	5.8	6.2	6.0	5.9	5.7	5.4	4.7	4.4	3.8	3.6	3.7	4.3	4.4	4.6	4.2	4.0	4.6	5.6	5.6	5.4	5.5	5.3	5.6	6.4	6.1

Figure 32. ATOVS MEAN O-B brightness temperature differences (deg C). MAY 2004
Channel: HIRS4 (400 hPa)
NOAA15, using all observations

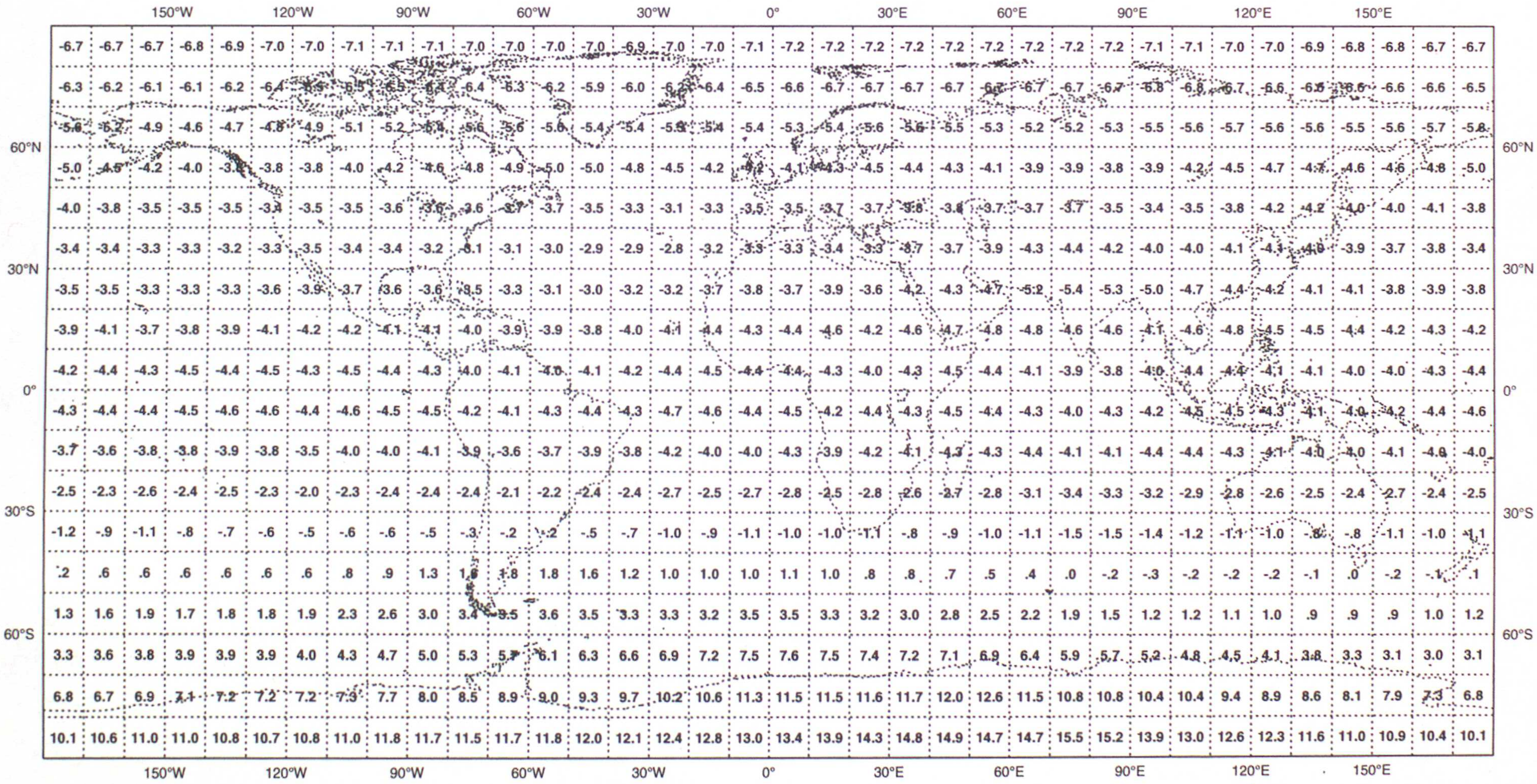
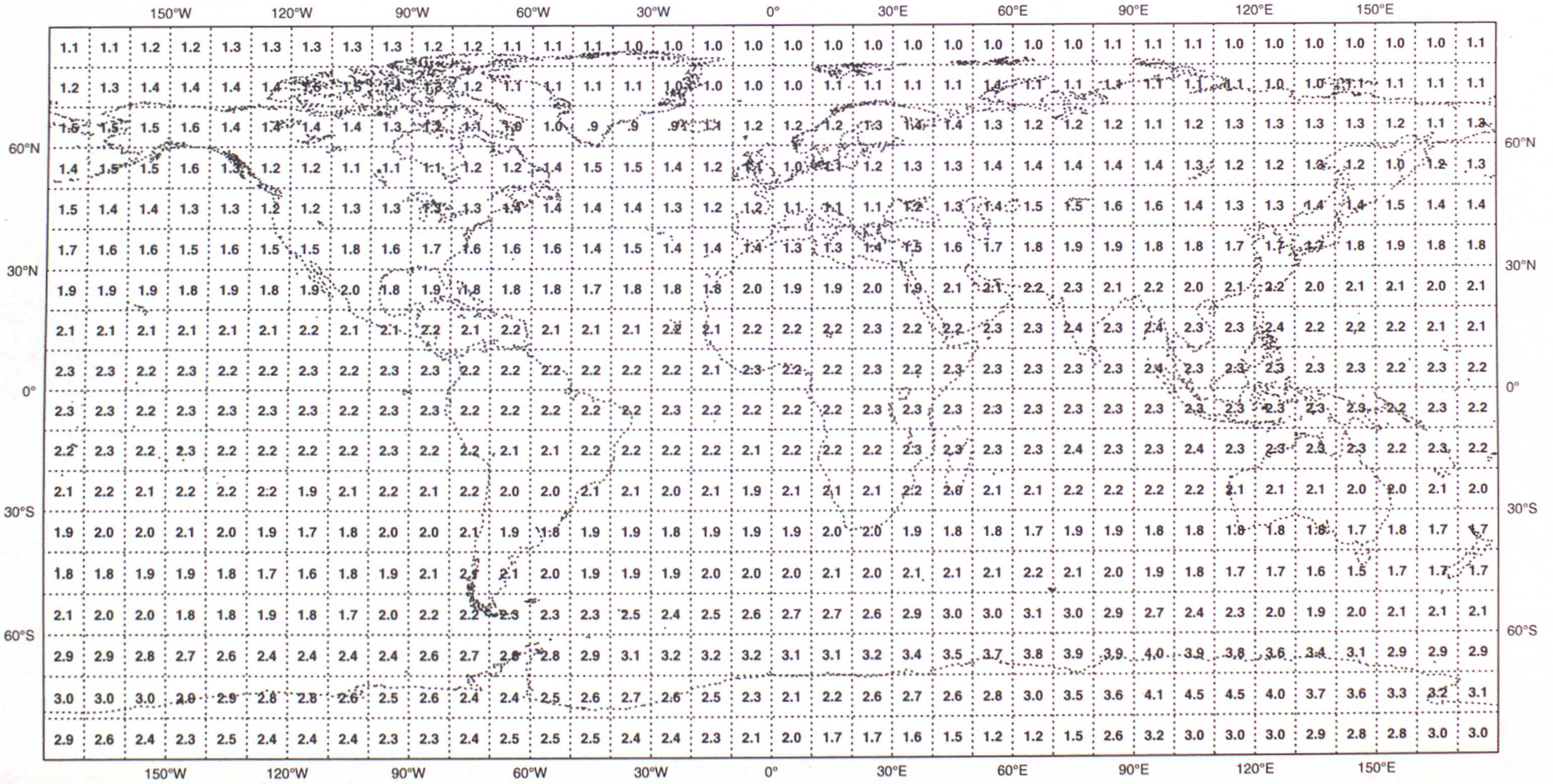

150°W
120°W
90°W
60°W
30°W
0°
30°E
60°E
90°E
120°E
150°E
60°N
30°N
0°
30°S
60°S
-6.7 -6.7 -6.7 -6.8 -6.9 -7.0 -7.0 -7.1 -7.1 -7.1 -7.0 -7.0 -7.0 -7.0 -6.9 -7.0 -7.0 -7.1 -7.2 -7.2 -7.2 -7.2 -7.2 -7.2 -7.2 -7.2 -7.2 -7.1 -7.1 -7.0 -7.0 -6.9 -6.8 -6.8 -6.7 -6.7
-6.3 -6.2 -6.1 -6.1 -6.2 -6.4 -6.5 -6.5 -6.5 -6.4 -6.4 -6.3 -6.2 -5.9 -6.0 -6.2 -6.4 -6.5 -6.6 -6.7 -6.7 -6.7 -6.7 -6.7 -6.7 -6.7 -6.7 -6.8 -6.8 -6.7 -6.6 -6.5 -6.6 -6.6 -6.6 -6.5
-5.6 -5.7 -4.9 -4.6 -4.7 -4.8 -4.9 -5.1 -5.2 -5.4 -5.6 -5.6 -5.6 -5.4 -5.4 -5.5 -5.4 -5.4 -5.3 -5.4 -5.6 -5.6 -5.5 -5.3 -5.2 -5.2 -5.3 -5.5 -5.6 -5.7 -5.6 -5.6 -5.5 -5.6 -5.7 -5.8
-5.0 -4.5 -4.2 -4.0 -3.8 -3.8 -3.8 -4.0 -4.2 -4.6 -4.8 -4.9 -5.0 -5.0 -4.8 -4.5 -4.2 -4.2 -4.1 -4.3 -4.5 -4.4 -4.3 -4.1 -3.9 -3.9 -3.8 -3.9 -4.2 -4.5 -4.7 -4.7 -4.6 -4.6 -4.8 -5.0
-4.0 -3.8 -3.5 -3.5 -3.5 -3.4 -3.5 -3.5 -3.6 -3.6 -3.6 -3.7 -3.7 -3.5 -3.3 -3.1 -3.3 -3.5 -3.5 -3.7 -3.7 -3.8 -3.8 -3.7 -3.7 -3.7 -3.5 -3.4 -3.5 -3.8 -4.2 -4.2 -4.0 -4.0 -4.1 -3.8
-3.4 -3.4 -3.3 -3.3 -3.2 -3.3 -3.5 -3.4 -3.4 -3.2 -3.1 -3.1 -3.0 -2.9 -2.9 -2.8 -3.2 -3.3 -3.3 -3.4 -3.3 -3.7 -3.7 -3.9 -4.3 -4.4 -4.2 -4.0 -4.0 -4.1 -4.1 -4.0 -3.9 -3.7 -3.8 -3.4
-3.5 -3.5 -3.3 -3.3 -3.3 -3.6 -3.9 -3.7 -3.6 -3.6 -3.5 -3.3 -3.1 -3.0 -3.2 -3.2 -3.7 -3.8 -3.7 -3.9 -3.6 -4.2 -4.3 -4.7 -5.2 -5.4 -5.3 -5.0 -4.7 -4.4 -4.2 -4.1 -4.1 -3.8 -3.9 -3.8
-3.9 -4.1 -3.7 -3.8 -3.9 -4.1 -4.2 -4.2 -4.1 -4.1 -4.0 -3.9 -3.9 -3.8 -4.0 -4.1 -4.4 -4.3 -4.4 -4.6 -4.2 -4.6 -4.7 -4.8 -4.8 -4.6 -4.6 -4.1 -4.6 -4.8 -4.5 -4.5 -4.4 -4.2 -4.3 -4.2
-4.2 -4.4 -4.3 -4.5 -4.4 -4.5 -4.3 -4.5 -4.4 -4.3 -4.0 -4.1 -4.0 -4.1 -4.2 -4.4 -4.5 -4.4 -4.4 -4.3 -4.0 -4.3 -4.5 -4.4 -4.1 -3.9 -3.8 -4.0 -4.4 -4.4 -4.1 -4.1 -4.0 -4.0 -4.3 -4.4
-4.3 -4.4 -4.4 -4.5 -4.6 -4.6 -4.4 -4.6 -4.5 -4.5 -4.2 -4.1 -4.3 -4.4 -4.3 -4.7 -4.6 -4.4 -4.5 -4.2 -4.4 -4.3 -4.5 -4.4 -4.3 -4.0 -4.3 -4.2 -4.5 -4.5 -4.3 -4.1 -4.0 -4.2 -4.4 -4.6
-3.7 -3.6 -3.8 -3.8 -3.9 -3.8 -3.5 -4.0 -4.0 -4.1 -3.9 -3.6 -3.7 -3.9 -3.8 -4.2 -4.0 -4.0 -4.3 -3.9 -4.2 -4.1 -4.3 -4.3 -4.4 -4.1 -4.1 -4.4 -4.4 -4.3 -4.1 -4.0 -4.0 -4.1 -4.9 -4.0
-2.5 -2.3 -2.6 -2.4 -2.5 -2.3 -2.0 -2.3 -2.4 -2.4 -2.4 -2.1 -2.2 -2.4 -2.4 -2.7 -2.5 -2.7 -2.8 -2.5 -2.8 -2.6 -2.7 -2.8 -3.1 -3.4 -3.3 -3.2 -2.9 -2.8 -2.6 -2.5 -2.4 -2.7 -2.4 -2.5
-1.2 -.9 -1.1 -.8 -.7 -.6 -.5 -.6 -.6 -.5 -.3 -.2 -.2 -.5 -.7 -1.0 -.9 -1.1 -1.0 -1.0 -1.1 -.8 -.9 -1.0 -1.1 -1.5 -1.5 -1.4 -1.2 -1.1 -1.0 -.8 -.8 -1.1 -1.0 -1.1
.2 .6 .6 .6 .6 .6 .6 .8 .9 1.3 1.6 1.8 1.8 1.6 1.2 1.0 1.0 1.0 1.1 1.0 .8 .8 .7 .5 .4 .0 -.2 -.3 -.2 -.2 -.2 -.1 .0 -.2 -.1 .1
1.3 1.6 1.9 1.7 1.8 1.8 1.9 2.3 2.6 3.0 3.4 3.5 3.6 3.5 3.3 3.3 3.2 3.5 3.5 3.3 3.2 3.0 2.8 2.5 2.2 1.9 1.5 1.2 1.2 1.1 1.0 .9 .9 .9 1.0 1.2
3.3 3.6 3.8 3.9 3.9 3.9 4.0 4.3 4.7 5.0 5.3 5.7 6.1 6.3 6.6 6.9 7.2 7.5 7.6 7.5 7.4 7.2 7.1 6.9 6.4 5.9 5.7 5.2 4.8 4.5 4.1 3.8 3.3 3.1 3.0 3.1
6.8 6.7 6.9 7.1 7.2 7.2 7.2 7.3 7.7 8.0 8.5 8.9 9.0 9.3 9.7 10.2 10.6 11.3 11.5 11.5 11.6 11.7 12.0 12.6 11.5 10.8 10.8 10.4 10.4 9.4 8.9 8.6 8.1 7.9 7.3 6.8
10.1 10.6 11.0 11.0 10.8 10.7 10.8 11.0 11.8 11.7 11.5 11.7 11.8 12.0 12.1 12.4 12.8 13.0 13.4 13.9 14.3 14.8 14.9 14.7 14.7 15.5 15.2 13.9 13.0 12.6 12.3 11.6 11.0 10.9 10.4 10.1

Figure 33. ATOVS SD O-B brightness temperature differences (deg C). MAY 2004
Channel: HIRS4 (400 hPa)
NOAA15, using all observations



1.1	1.1	1.2	1.2	1.3	1.3	1.3	1.3	1.3	1.2	1.2	1.1	1.1	1.1	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.1	1.1	1.1	1.0	1.0	1.0	1.0	1.0	1.0	1.1
1.2	1.3	1.4	1.4	1.4	1.4	1.6	1.5	1.4	1.3	1.2	1.1	1.1	1.1	1.1	1.0	1.0	1.0	1.0	1.1	1.1	1.1	1.1	1.4	1.1	1.1	1.1	1.1	1.1	1.1	1.0	1.0	1.1	1.1	1.1	1.1
1.5	1.5	1.5	1.6	1.4	1.4	1.4	1.4	1.3	1.2	1.1	1.0	1.0	.9	.9	.9	1.1	1.2	1.2	1.2	1.3	1.4	1.4	1.3	1.2	1.2	1.2	1.1	1.2	1.3	1.3	1.3	1.3	1.2	1.1	1.3
1.4	1.5	1.5	1.6	1.3	1.2	1.2	1.1	1.1	1.1	1.2	1.2	1.4	1.5	1.5	1.4	1.2	1.1	1.0	1.1	1.2	1.3	1.3	1.4	1.4	1.4	1.4	1.4	1.3	1.2	1.2	1.3	1.2	1.0	1.2	1.3
1.5	1.4	1.4	1.3	1.3	1.2	1.2	1.3	1.3	1.3	1.3	1.4	1.4	1.4	1.4	1.3	1.2	1.2	1.1	1.1	1.1	1.2	1.3	1.4	1.5	1.5	1.6	1.6	1.4	1.3	1.3	1.4	1.4	1.5	1.4	1.4
1.7	1.6	1.6	1.5	1.6	1.5	1.5	1.8	1.6	1.7	1.6	1.6	1.6	1.4	1.5	1.4	1.4	1.4	1.3	1.3	1.4	1.5	1.6	1.7	1.8	1.9	1.9	1.8	1.8	1.7	1.7	1.7	1.8	1.9	1.8	1.8
1.9	1.9	1.9	1.8	1.9	1.8	1.9	2.0	1.8	1.9	1.8	1.8	1.8	1.7	1.8	1.8	1.8	2.0	1.9	1.9	2.0	1.9	2.1	2.1	2.2	2.3	2.1	2.2	2.0	2.1	2.2	2.0	2.1	2.1	2.0	2.1
2.1	2.1	2.1	2.1	2.1	2.1	2.2	2.1	2.1	2.2	2.1	2.2	2.1	2.1	2.1	2.2	2.1	2.2	2.2	2.2	2.3	2.2	2.2	2.3	2.3	2.4	2.3	2.4	2.3	2.3	2.4	2.2	2.2	2.2	2.1	2.1
2.3	2.3	2.2	2.3	2.2	2.2	2.3	2.2	2.3	2.3	2.2	2.2	2.2	2.2	2.2	2.2	2.1	2.3	2.2	2.2	2.3	2.2	2.3	2.3	2.3	2.3	2.3	2.4	2.3	2.3	2.3	2.3	2.3	2.2	2.3	2.2
2.3	2.3	2.2	2.3	2.3	2.3	2.3	2.2	2.3	2.3	2.2	2.2	2.2	2.2	2.2	2.3	2.2	2.2	2.2	2.2	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.2	2.3	2.2
2.2	2.3	2.2	2.3	2.2	2.2	2.2	2.2	2.3	2.2	2.2	2.1	2.1	2.2	2.2	2.2	2.2	2.1	2.2	2.2	2.2	2.3	2.3	2.3	2.3	2.4	2.3	2.3	2.4	2.3	2.3	2.3	2.3	2.2	2.3	2.2
2.1	2.2	2.1	2.2	2.2	2.2	1.9	2.1	2.2	2.1	2.2	2.0	2.0	2.1	2.1	2.0	2.1	1.9	2.1	2.1	2.1	2.2	2.0	2.1	2.1	2.2	2.2	2.2	2.2	2.1	2.1	2.1	2.0	2.0	2.1	2.0
1.9	2.0	2.0	2.1	2.0	1.9	1.7	1.8	2.0	2.0	2.1	1.9	1.8	1.9	1.9	1.8	1.9	1.9	1.9	2.0	2.0	1.9	1.8	1.8	1.7	1.9	1.9	1.8	1.8	1.8	1.8	1.8	1.7	1.8	1.7	1.7
1.8	1.8	1.9	1.9	1.8	1.7	1.6	1.8	1.9	2.1	2.1	2.1	2.0	1.9	1.9	1.9	2.0	2.0	2.0	2.1	2.0	2.1	2.1	2.1	2.2	2.1	2.0	1.9	1.8	1.7	1.7	1.6	1.5	1.7	1.7	1.7
2.1	2.0	2.0	1.8	1.8	1.9	1.8	1.7	2.0	2.2	2.2	2.3	2.3	2.3	2.5	2.4	2.5	2.6	2.7	2.7	2.6	2.9	3.0	3.0	3.1	3.0	2.9	2.7	2.4	2.3	2.0	1.9	2.0	2.1	2.1	2.1
2.9	2.9	2.8	2.7	2.6	2.4	2.4	2.4	2.4	2.6	2.7	2.8	2.8	2.9	3.1	3.2	3.2	3.2	3.1	3.1	3.2	3.4	3.5	3.7	3.8	3.9	3.9	4.0	3.9	3.8	3.6	3.4	3.1	2.9	2.9	2.9
3.0	3.0	3.0	2.8	2.9	2.8	2.8	2.6	2.5	2.6	2.4	2.4	2.5	2.6	2.7	2.6	2.5	2.3	2.1	2.2	2.6	2.7	2.6	2.8	3.0	3.5	3.6	4.1	4.5	4.5	4.0	3.7	3.6	3.3	3.2	3.1
2.9	2.6	2.4	2.3	2.5	2.4	2.4	2.4	2.3	2.3	2.4	2.5	2.5	2.5	2.4	2.4	2.3	2.1	2.0	1.7	1.7	1.6	1.5	1.2	1.2	1.5	2.6	3.2	3.0	3.0	3.0	2.9	2.8	2.8	3.0	3.0

Figure 34. ATOVS MEAN O-B brightness temperature differences (deg C). MAY 2004
Channel: AMSUA-5 (700 hPa)
NOAA15, using all observations

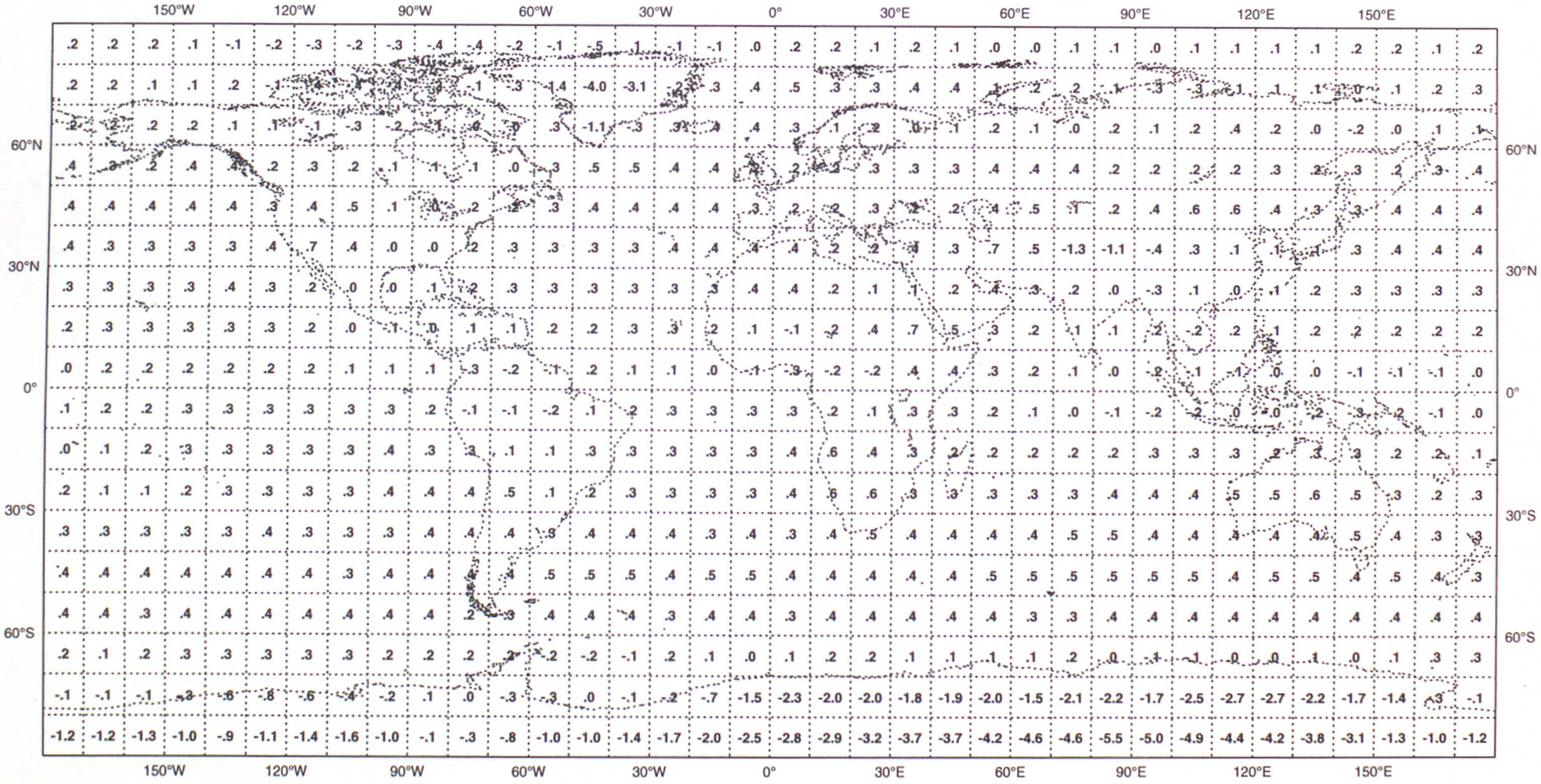

150°W 120°W 90°W 60°W 30°W 0° 30°E 60°E 90°E 120°E 150°E
60°N
30°N
0°
30°S
60°S
.2 .2 .2 .1 -.1 -.2 -.3 -.2 -.3 -.4 -.4 -.2 -.1 -.5 .1 -.1 -.1 .0 .2 .2 .1 .2 .1 .0 .0 .1 .1 .0 .1 .1 .1 .1 .2 .2 .1 .2
.2 .2 .1 .1 .2 -.1 .4 .4 .4 .3 -.1 -.3 -1.4 -4.0 -3.1 -.2 .3 .4 .5 .3 .3 .4 .4 .1 .2 .2 .1 -.3 -.3 .1 .1 .1 .0 .1 .2 .3
.2 .2 .2 .2 .1 .1 -.1 -.3 -.2 -.1 .0 .0 .3 -1.1 -.3 .3 .4 .4 .3 .1 .2 .0 .1 .2 .1 .0 .2 .1 .2 .4 .2 .0 -.2 .0 .1 .1
.4 .3 .2 .4 .4 .2 .3 .2 .1 .1 .1 .0 .3 .5 .5 .4 .4 .2 .2 .2 .3 .3 .3 .4 .4 .4 .2 .2 .2 .2 .3 .2 .3 .2 .3 .4
.4 .4 .4 .4 .4 .3 .4 .5 .1 .0 .2 .2 .3 .4 .4 .4 .4 .3 .2 .2 .3 .2 .2 .4 .5 .1 .2 .4 .6 .6 .4 .3 .3 .4 .4 .4
.4 .3 .3 .3 .3 .4 .7 .4 .0 .0 .2 .3 .3 .3 .3 .4 .4 .4 .4 .2 .2 .4 .3 .7 .5 -1.3 -1.1 -.4 .3 .1 .1 .1 .3 .4 .4 .4
.3 .3 .3 .3 .4 .3 .2 .0 .0 .1 .2 .3 .3 .3 .3 .3 .3 .4 .4 .2 .1 .1 .2 .4 .3 .2 .0 -.3 .1 .0 .1 .2 .3 .3 .3 .3
.2 .3 .3 .3 .3 .3 .2 .0 -.1 .0 .1 .1 .2 .2 .3 .3 .2 .1 -.1 .2 .4 .7 .5 .3 .2 .1 .1 -.2 -.2 .2 .1 .2 .2 .2 .2 .2
.0 .2 .2 .2 .2 .2 .2 .1 .1 .1 -.3 -.2 -.1 .2 .1 .1 .0 -.1 -.3 -.2 -.2 .4 .4 .3 .2 .1 .0 -.2 -.1 -.1 .0 .0 -.1 -.1 -.1 .0
.1 .2 .2 .3 .3 .3 .3 .3 .3 .2 -.1 -.1 -.2 .1 .2 .3 .3 .3 .3 .2 .1 .3 .3 .2 .1 .0 -.1 -.2 -.2 .0 .0 -.2 -.3 -.2 -.1 .0
.0 .1 .2 .3 .3 .3 .3 .3 .4 .3 .3 .1 .1 .3 .3 .3 .3 .3 .4 .6 .4 .3 .2 .2 .2 .2 .2 .3 .3 .3 .2 .3 .3 .2 .2 .1
.2 .1 .1 .2 .3 .3 .3 .3 .4 .4 .4 .5 .1 .2 .3 .3 .3 .3 .4 .6 .6 .3 .3 .3 .3 .3 .4 .4 .4 .5 .5 .6 .5 .3 .2 .3
.3 .3 .3 .3 .3 .4 .3 .3 .3 .4 .4 .4 .3 .4 .4 .4 .3 .4 .3 .4 .5 .4 .4 .4 .4 .5 .5 .4 .4 .4 .4 .4 .5 .4 .3 .3
.4 .4 .4 .4 .4 .4 .4 .3 .4 .4 .4 .4 .5 .5 .5 .4 .5 .5 .4 .4 .4 .4 .4 .5 .5 .5 .5 .5 .5 .4 .5 .5 .4 .5 .4 .3
.4 .4 .3 .4 .4 .4 .4 .4 .4 .4 .2 .3 .4 .4 .4 .3 .4 .4 .3 .4 .4 .4 .4 .4 .3 .3 .4 .4 .4 .4 .4 .4 .4 .4 .4 .4
.2 .1 .2 .3 .3 .3 .3 .3 .2 .2 .2 .2 .2 -.2 -.1 .2 .1 .0 .1 .2 .2 .1 .1 .1 .1 .2 .0 -.1 -.1 .0 .0 .1 .0 .1 .3 .3
-.1 -.1 -.1 -.3 -.6 -.8 -.6 -.4 -.2 .1 .0 -.3 -.3 .0 -.1 -.2 -.7 -1.5 -2.3 -2.0 -2.0 -1.8 -1.9 -2.0 -1.5 -2.1 -2.2 -1.7 -2.5 -2.7 -2.7 -2.2 -1.7 -1.4 -.3 -.1
-1.2 -1.2 -1.3 -1.0 -.9 -1.1 -1.4 -1.6 -1.0 -.1 -.3 -.8 -1.0 -1.0 -1.4 -1.7 -2.0 -2.5 -2.8 -2.9 -3.2 -3.7 -3.7 -4.2 -4.6 -4.6 -5.5 -5.0 -4.9 -4.4 -4.2 -3.8 -3.1 -1.3 -1.0 -1.2

Figure 35. ATOVS SD O-B brightness temperature differences (deg C). MAY 2004
Channel: AMSUA-5 (700 hPa)
NOAA15, using all observations

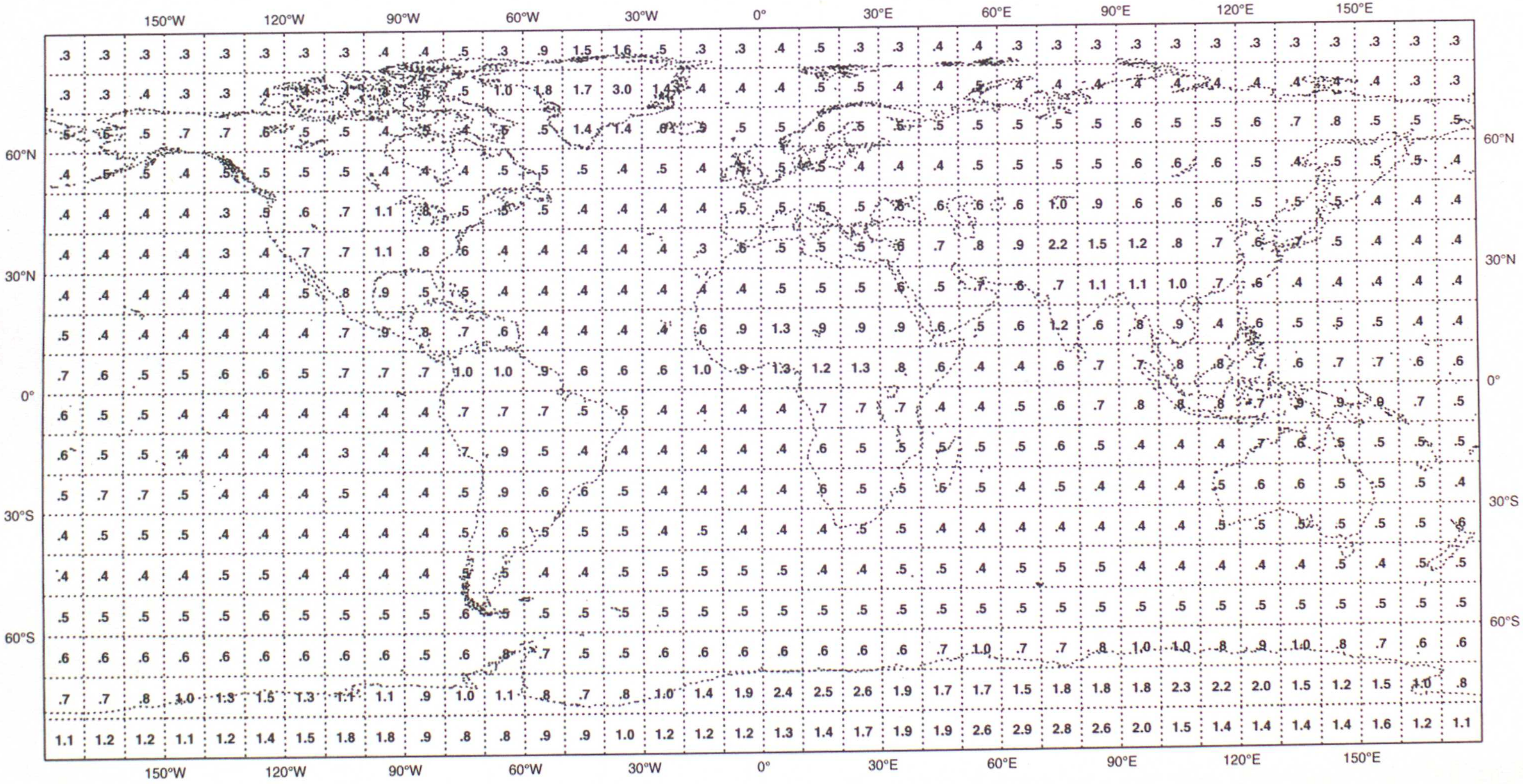

150°W
120°W
90°W
60°W
30°W
0°
30°E
60°E
90°E
120°E
150°E
60°N
30°N
0°
30°S
60°S
.3 .3 .3 .3 .3 .3 .3 .3 .4 .4 .5 .3 .9 1.5 1.6 .5 .3 .3 .4 .5 .3 .3 .4 .4 .3 .3 .3 .3 .3 .3 .3 .3 .3 .3 .3 .3
.3 .3 .4 .3 .3 .4 .4 .4 .4 .5 .5 1.0 1.8 1.7 3.0 1.4 .4 .4 .4 .5 .5 .4 .4 .5 .4 .4 .4 .4 .4 .4 .4 .4 .4 .4 .3 .3
.5 .6 .5 .7 .7 .6 .5 .5 .4 .5 .4 .5 .5 1.4 1.4 .6 .5 .5 .5 .6 .5 .5 .5 .5 .5 .5 .5 .6 .5 .5 .6 .7 .8 .5 .5 .5
.4 .5 .5 .4 .5 .5 .5 .5 .4 .4 .4 .5 .5 .5 .4 .5 .4 .5 .5 .5 .4 .4 .4 .5 .5 .5 .5 .6 .6 .6 .5 .4 .5 .5 .5 .4
.4 .4 .4 .4 .3 .5 .6 .7 1.1 .8 .5 .5 .5 .4 .4 .4 .4 .5 .5 .5 .5 .6 .6 .6 .6 1.0 .9 .6 .6 .6 .5 .5 .5 .4 .4 .4
.4 .4 .4 .4 .3 .4 .7 .7 1.1 .8 .6 .4 .4 .4 .4 .4 .3 .6 .5 .5 .5 .6 .7 .8 .9 2.2 1.5 1.2 .8 .7 .6 .7 .5 .4 .4 .4
.4 .4 .4 .4 .4 .4 .5 .8 .9 .5 .5 .4 .4 .4 .4 .4 .4 .4 .5 .5 .5 .6 .5 .7 .6 .7 1.1 1.1 1.0 .7 .6 .4 .4 .4 .4 .4
.5 .4 .4 .4 .4 .4 .4 .7 .9 .8 .7 .6 .4 .4 .4 .4 .6 .9 1.3 .9 .9 .9 .6 .5 .6 1.2 .6 .8 .9 .4 .6 .5 .5 .5 .4 .4
.7 .6 .5 .5 .6 .6 .5 .7 .7 .7 1.0 1.0 .9 .6 .6 .6 1.0 .9 1.3 1.2 1.3 .8 .6 .4 .4 .6 .7 .7 .8 .8 .7 .6 .7 .7 .6 .6
.6 .5 .5 .4 .4 .4 .4 .4 .4 .4 .7 .7 .7 .5 .5 .4 .4 .4 .4 .7 .7 .7 .4 .4 .5 .6 .7 .8 .8 .8 .7 .9 .9 .9 .7 .5
.6 .5 .5 .4 .4 .4 .4 .3 .4 .4 .7 .9 .5 .4 .4 .4 .4 .4 .4 .6 .5 .5 .5 .5 .5 .6 .5 .4 .4 .4 .7 .6 .5 .5 .5 .5
.5 .7 .7 .5 .4 .4 .4 .5 .4 .4 .5 .9 .6 .6 .5 .4 .4 .4 .4 .6 .5 .5 .6 .5 .4 .5 .4 .4 .4 .5 .6 .6 .5 .5 .5 .4
.4 .5 .5 .5 .4 .4 .4 .4 .4 .4 .5 .6 .5 .5 .5 .4 .5 .4 .4 .4 .5 .5 .4 .4 .4 .4 .4 .4 .4 .5 .5 .5 .5 .5 .5 .6
.4 .4 .4 .4 .5 .5 .4 .4 .4 .4 .5 .5 .4 .4 .5 .5 .5 .5 .5 .4 .4 .5 .5 .4 .5 .5 .5 .4 .4 .4 .4 .4 .5 .4 .5 .5
.5 .5 .5 .5 .5 .6 .5 .5 .5 .5 .6 .5 .5 .5 .5 .5 .5 .5 .5 .5 .5 .5 .5 .5 .5 .5 .5 .5 .5 .5 .5 .5 .5 .5 .5 .5
.6 .6 .6 .6 .6 .6 .6 .6 .6 .5 .6 .8 .7 .5 .5 .6 .6 .6 .6 .6 .6 .6 .7 1.0 .7 .7 .8 1.0 1.0 .8 .9 1.0 .8 .7 .6 .6
.7 .7 .8 1.0 1.3 1.5 1.3 1.1 1.1 .9 1.0 1.1 .8 .7 .8 1.0 1.4 1.9 2.4 2.5 2.6 1.9 1.7 1.7 1.5 1.8 1.8 1.8 2.3 2.2 2.0 1.5 1.2 1.5 1.0 .8
1.1 1.2 1.2 1.1 1.2 1.4 1.5 1.8 1.8 .9 .8 .8 .9 .9 1.0 1.2 1.2 1.2 1.3 1.4 1.7 1.9 1.9 2.6 2.9 2.8 2.6 2.0 1.5 1.4 1.4 1.4 1.4 1.6 1.2 1.1

Figure 36. ATOVS MEAN O-B brightness temperature differences (deg C). MAY 2004
Channel: AMSUA-7 (300 hPa)
NOAA15, using all observations

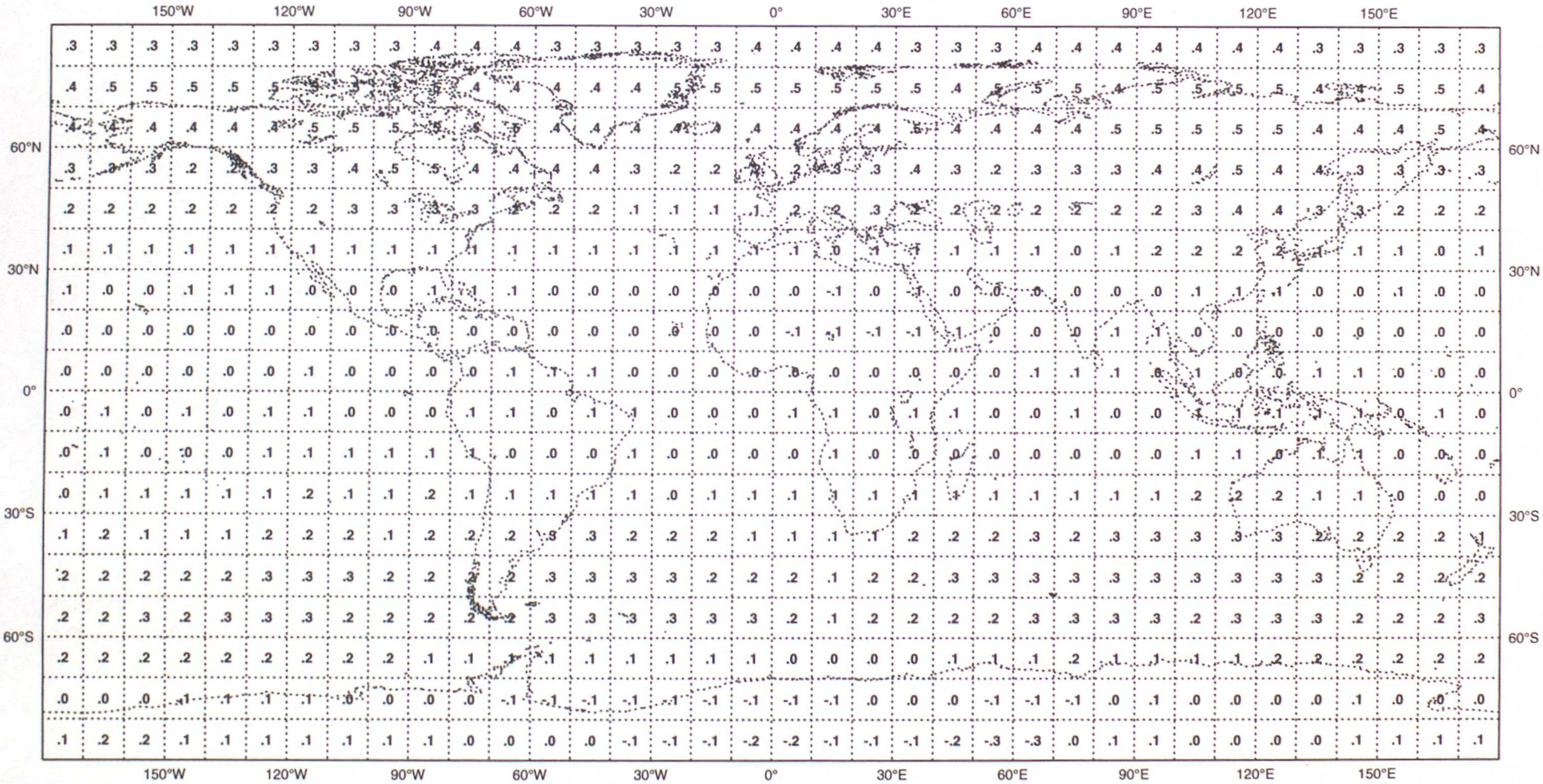

150°W
120°W
90°W
60°W
30°W
0°
30°E
60°E
90°E
120°E
150°E
60°N
30°N
0°
30°S
60°S

Figure 37. ATOVS SD O-B brightness temperature differences (deg C). MAY 2004
Channel: AMSUA-7 (300 hPa)
NOAA15, using all observations

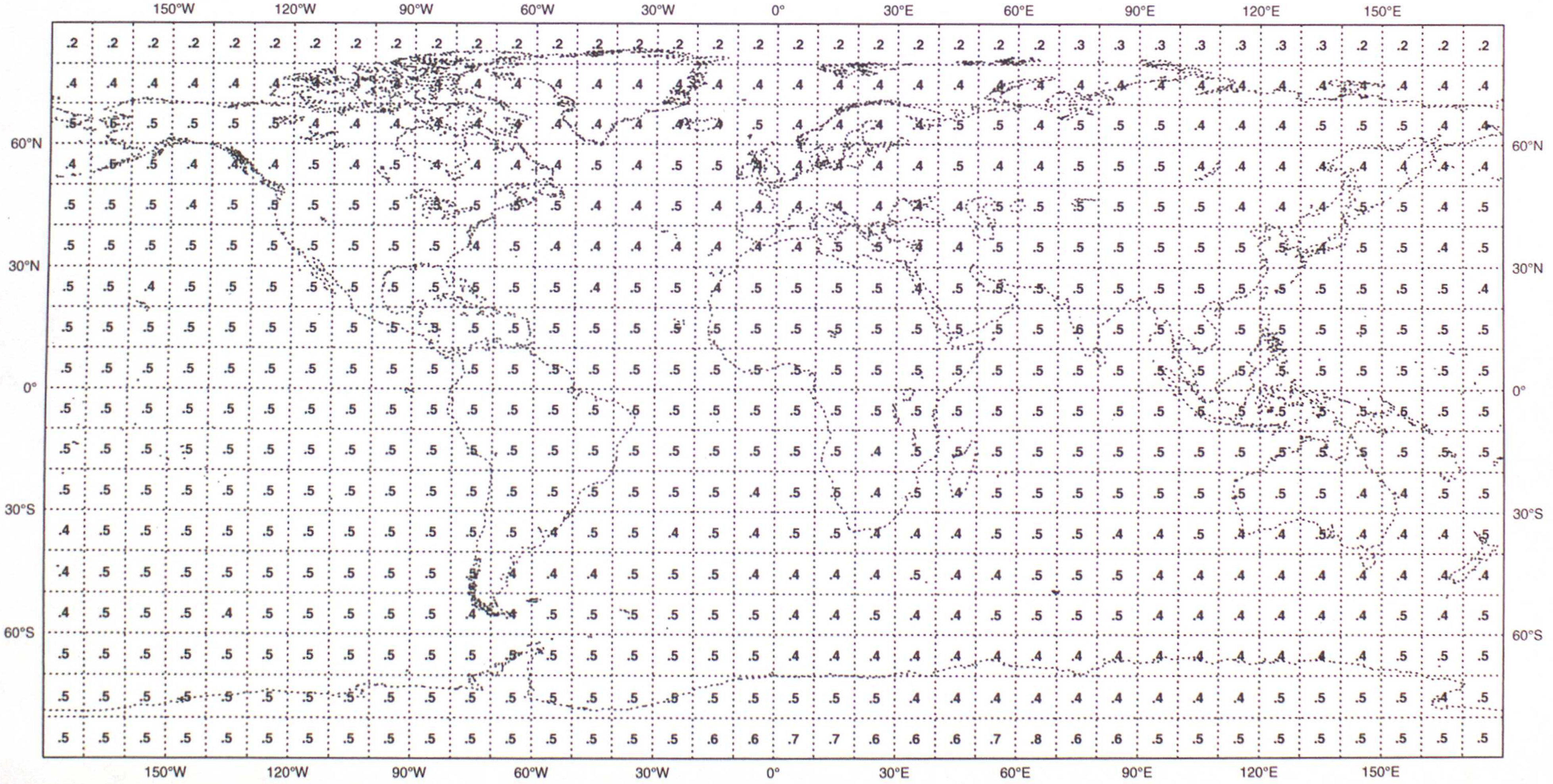

150°W
120°W
90°W
60°W
30°W
0°
30°E
60°E
90°E
120°E
150°E
60°N
30°N
0°
30°S
60°S

Figure 38. ATOVS MEAN O-B brightness temperature differences (deg C). MAY 2004
Channel: AMSUA-9 (100 hPa)
NOAA15, using all observations

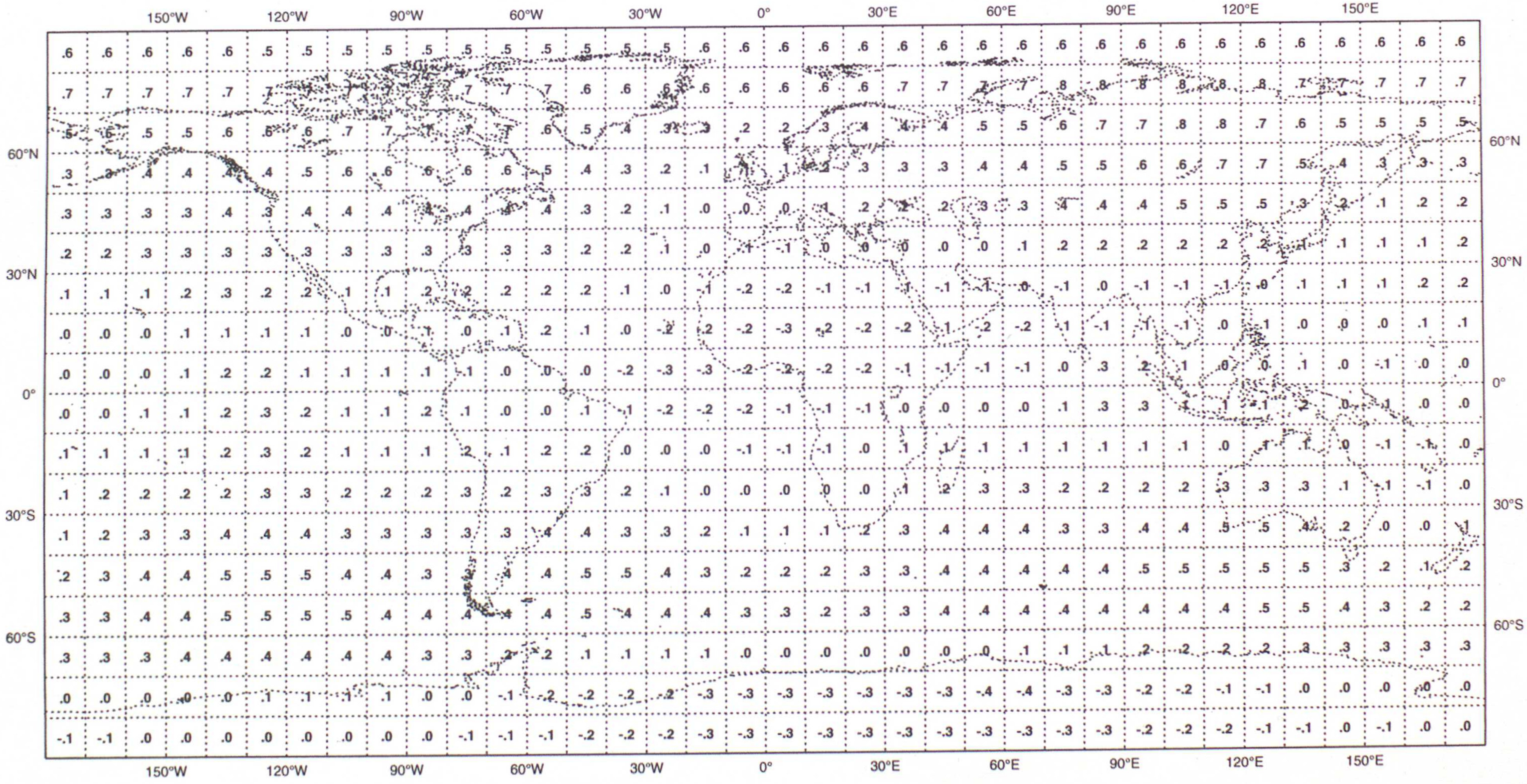

150°W 120°W 90°W 60°W 30°W 0° 30°E 60°E 90°E 120°E 150°E
60°N 30°N 0° 30°S 60°S
.6 .6 .6 .6 .6 .5 .5 .5 .5 .5 .5 .5 .5 .5 .5 .5 .6 .6 .6 .6 .6 .6 .6 .6 .6 .6 .6 .6 .6 .6 .6 .6 .6 .6 .6 .6
.7 .7 .7 .7 .7 .7 .7 .7 .7 .7 .7 .7 .7 .6 .6 .6 .6 .6 .6 .6 .6 .7 .7 .7 .7 .8 .8 .8 .8 .8 .8 .7 .7 .7 .7 .7
.5 .5 .5 .5 .6 .6 .6 .7 .7 .7 .7 .7 .6 .5 .4 .3 .3 .2 .2 .3 .4 .4 .4 .5 .5 .6 .7 .7 .8 .8 .7 .6 .5 .5 .5 .5
.3 .3 .4 .4 .4 .4 .5 .6 .6 .6 .6 .6 .5 .4 .3 .2 .1 .1 .1 .2 .3 .3 .3 .4 .4 .5 .5 .6 .6 .7 .7 .5 .4 .3 .3 .3
.3 .3 .3 .3 .4 .3 .4 .4 .4 .4 .4 .4 .4 .3 .2 .1 .0 .0 .0 .1 .2 .2 .2 .3 .3 .4 .4 .4 .5 .5 .5 .3 .2 .1 .2 .2
.2 .2 .3 .3 .3 .3 .3 .3 .3 .3 .3 .3 .3 .2 .2 .1 .0 -.1 -.1 .0 .0 .0 .0 .0 .1 .2 .2 .2 .2 .2 .2 .1 .1 .1 .1 .2
.1 .1 .1 .2 .3 .2 .2 .1 .1 .2 .2 .2 .2 .2 .1 .0 -.1 -.2 -.2 -.1 -.1 -.1 -.1 -.1 .0 -.1 .0 -.1 -.1 -.1 .0 .1 .1 .1 .2 .2
.0 .0 .0 .1 .1 .1 .1 .0 .0 .1 .0 .1 .2 .1 .0 -.2 -.2 -.2 -.3 -.2 -.2 -.2 -.1 -.2 -.2 -.1 -.1 -.1 -.1 .0 -.1 .0 .0 .0 .1 .1
.0 .0 .0 .1 .2 .2 .1 .1 .1 .1 -.1 .0 .0 .0 -.2 -.3 -.3 -.2 -.2 -.2 -.2 -.1 -.1 -.1 -.1 .0 .3 .2 .1 .0 .0 .1 .0 -.1 .0 .0
.0 .0 .1 .1 .2 .3 .2 .1 .1 .2 .1 .0 .0 .1 -.1 -.2 -.2 -.2 -.1 -.1 -.1 .0 .0 .0 .0 .1 .3 .3 .1 .1 .1 .2 .0 .1 .0 .0
.1 .1 .1 .1 .2 .3 .2 .1 .1 .1 .2 .1 .2 .2 .0 .0 .0 -.1 -.1 -.1 .0 .1 .1 .1 .1 .1 .1 .1 .1 .0 .1 .1 .0 -.1 -.1 .0
.1 .2 .2 .2 .2 .3 .3 .2 .2 .2 .3 .2 .3 .3 .2 .1 .0 .0 .0 .0 .0 .1 .2 .3 .3 .2 .2 .2 .2 .3 .3 .3 .1 -.1 -.1 .0
.1 .2 .3 .3 .4 .4 .4 .3 .3 .3 .3 .3 .4 .4 .3 .3 .2 .1 .1 .1 .2 .3 .4 .4 .4 .3 .3 .4 .4 .5 .5 .4 .2 .0 .0 .1
.2 .3 .4 .4 .5 .5 .5 .4 .4 .3 .3 .4 .4 .5 .5 .4 .3 .2 .2 .2 .3 .3 .4 .4 .4 .4 .4 .5 .5 .5 .5 .5 .3 .2 .1 .2
.3 .3 .4 .4 .5 .5 .5 .5 .4 .4 .4 .4 .4 .5 .4 .4 .4 .3 .3 .2 .3 .3 .4 .4 .4 .4 .4 .4 .4 .4 .5 .5 .4 .3 .2 .2
.3 .3 .3 .4 .4 .4 .4 .4 .4 .3 .3 .2 .2 .1 .1 .1 .1 .0 .0 .0 .0 .0 .0 .0 .1 .1 .1 .2 .2 .2 .2 .3 .3 .3 .3 .3
.0 .0 .0 .0 .0 .1 .1 .1 .1 .0 .0 -.1 -.2 -.2 -.2 -.2 -.3 -.3 -.3 -.3 -.3 -.3 -.3 -.4 -.4 -.3 -.3 -.2 -.2 -.1 -.1 .0 .0 .0 .0 .0
-.1 -.1 .0 .0 .0 .0 .0 .0 .0 .0 -.1 -.1 -.1 -.2 -.2 -.2 -.3 -.3 -.3 -.3 -.3 -.3 -.3 -.3 -.3 -.3 -.3 -.3 -.2 -.2 -.2 -.1 -.1 .0 -.1 .0 .0

Figure 39. ATOVS SD O-B brightness temperature differences (deg C). MAY 2004
Channel: AMSUA-9 (100 hPa)
NOAA15, using all observations

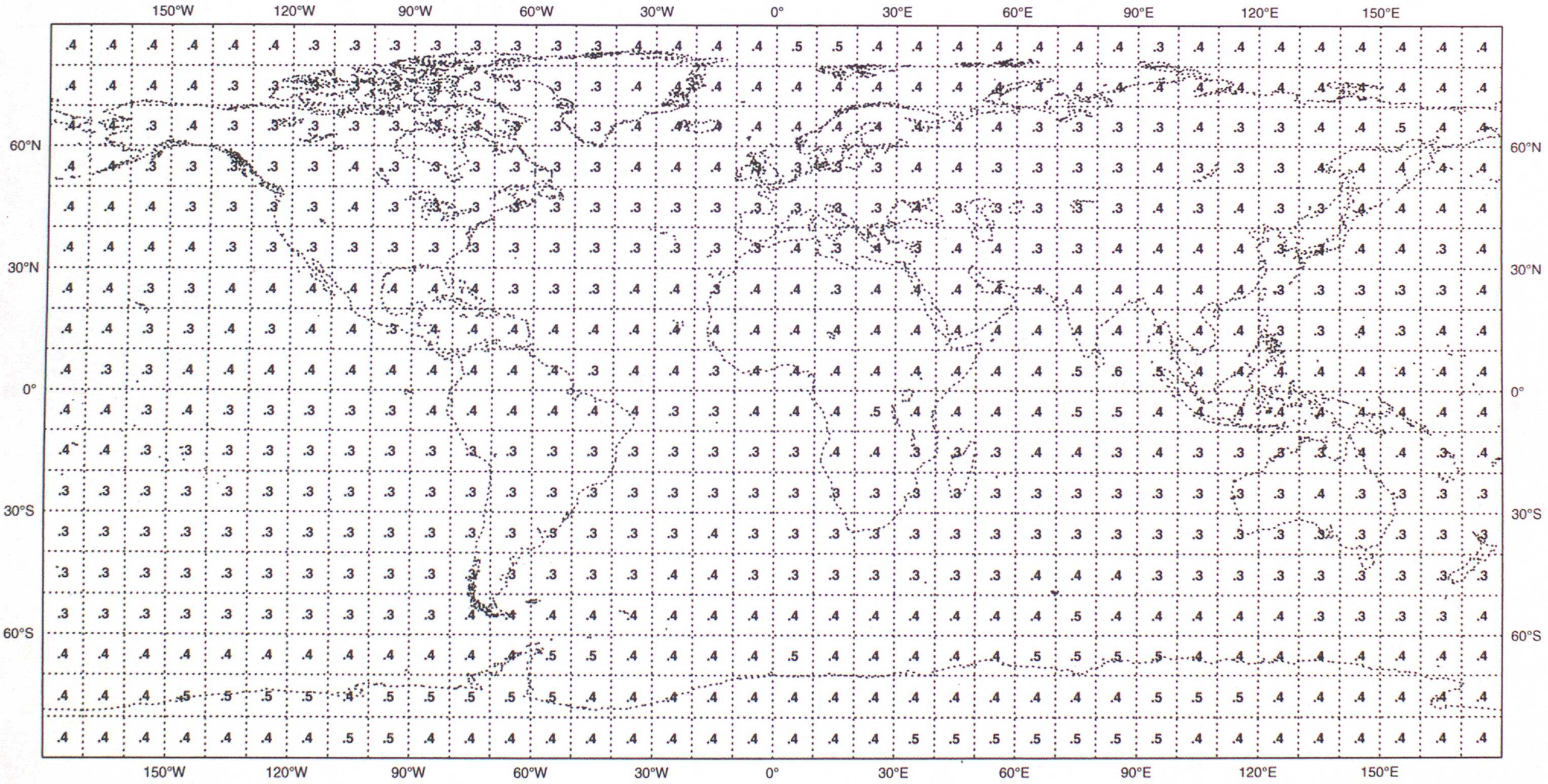
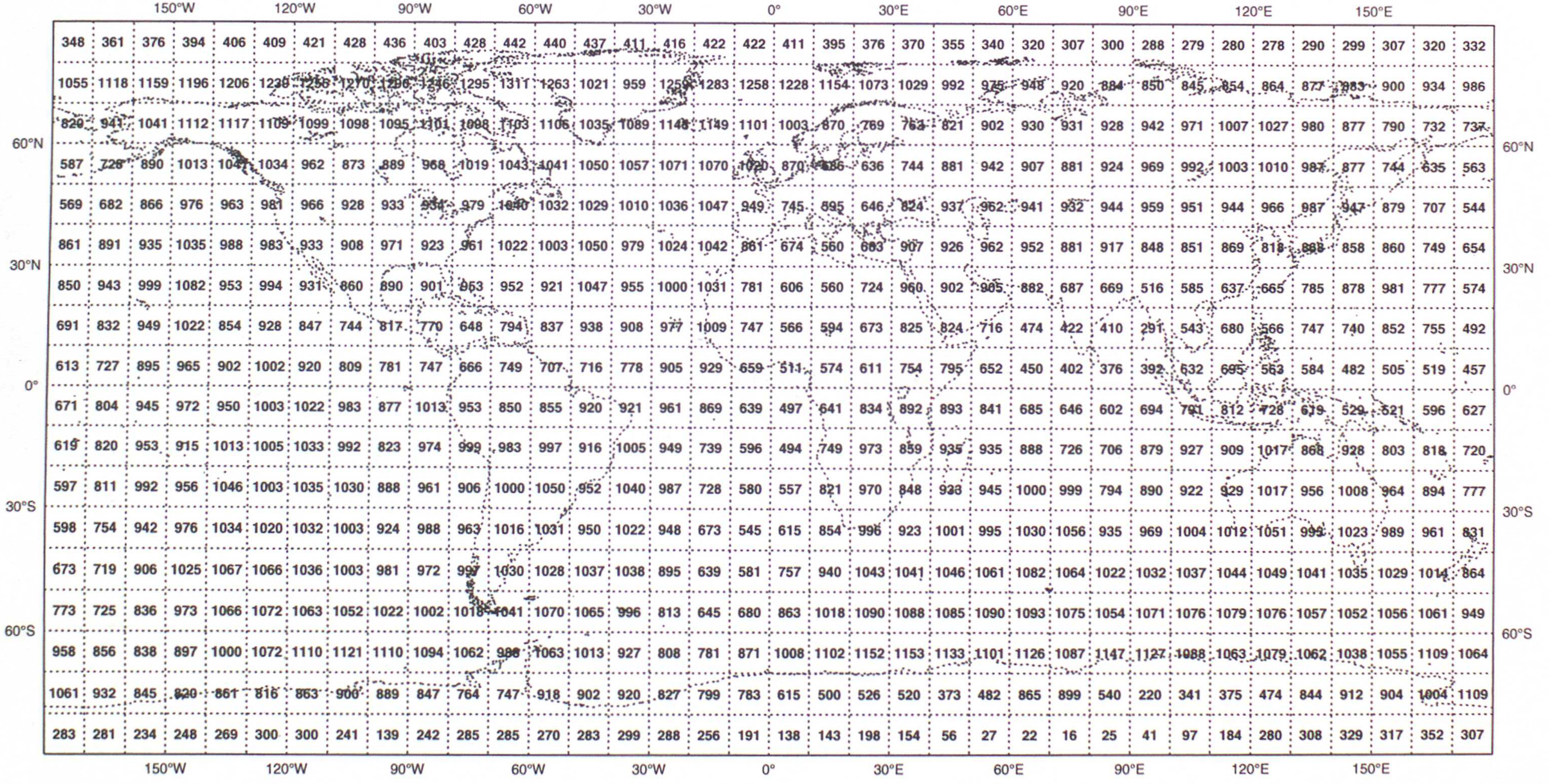

150°W
120°W
90°W
60°W
30°W
0°
30°E
60°E
90°E
120°E
150°E
60°N
30°N
0°
30°S
60°S
.4 .4 .4 .4 .4 .4 .3 .3 .3 .3 .3 .3 .3 .3 .4 .4 .4 .4 .5 .5 .4 .4 .4 .4 .4 .4 .4 .3 .4 .4 .4 .4 .4 .4 .4 .4
.4 .4 .4 .4 .3 .3 .3 .3 .3 .3 .3 .3 .3 .3 .4 .4 .4 .4 .4 .4 .4 .4 .4 .4 .4 .4 .4 .4 .4 .4 .4 .4 .4 .4 .4 .4
.4 .4 .3 .4 .3 .3 .3 .3 .3 .3 .3 .3 .3 .3 .4 .4 .4 .4 .4 .4 .4 .4 .4 .4 .3 .3 .3 .3 .4 .3 .3 .4 .4 .5 .4 .4
.4 .4 .3 .3 .3 .3 .3 .4 .3 .3 .3 .3 .3 .3 .4 .4 .4 .3 .3 .3 .3 .4 .4 .3 .3 .3 .3 .4 .3 .3 .3 .4 .4 .4 .4 .4
.4 .4 .4 .3 .3 .3 .3 .4 .3 .3 .3 .3 .3 .3 .3 .3 .3 .3 .3 .3 .3 .4 .3 .3 .3 .3 .3 .4 .3 .4 .3 .3 .4 .4 .4 .4
.4 .4 .4 .4 .3 .3 .3 .3 .3 .3 .3 .3 .3 .3 .3 .3 .3 .3 .4 .3 .4 .3 .4 .4 .3 .3 .4 .4 .4 .4 .3 .3 .4 .4 .3 .4
.4 .4 .3 .3 .4 .4 .4 .4 .4 .4 .4 .3 .3 .3 .4 .4 .3 .4 .4 .3 .4 .4 .4 .4 .4 .4 .4 .4 .4 .4 .3 .3 .3 .3 .3 .4
.4 .4 .3 .3 .4 .3 .4 .4 .3 .4 .4 .4 .4 .4 .4 .4 .4 .4 .4 .4 .4 .4 .4 .4 .4 .4 .4 .4 .4 .4 .3 .3 .4 .3 .4 .4
.4 .3 .3 .4 .4 .4 .4 .4 .4 .4 .4 .4 .4 .3 .4 .4 .3 .4 .4 .4 .4 .4 .4 .4 .4 .5 .6 .5 .4 .4 .4 .4 .4 .4 .4 .4
.4 .4 .3 .4 .3 .3 .3 .3 .3 .4 .4 .4 .4 .4 .4 .3 .3 .4 .4 .4 .5 .4 .4 .4 .4 .5 .5 .4 .4 .4 .4 .4 .4 .4 .4 .4
.4 .4 .3 .3 .3 .3 .3 .3 .3 .3 .3 .3 .3 .3 .3 .3 .3 .3 .3 .4 .4 .3 .3 .3 .4 .4 .3 .4 .3 .3 .3 .3 .4 .4 .3 .4
.3 .3 .3 .3 .3 .3 .3 .3 .3 .3 .3 .3 .3 .3 .3 .3 .3 .3 .3 .3 .3 .3 .3 .3 .3 .3 .3 .3 .3 .3 .3 .4 .3 .3 .3 .3
.3 .3 .3 .3 .3 .3 .3 .3 .3 .3 .3 .3 .3 .3 .3 .3 .4 .3 .3 .3 .3 .3 .3 .3 .3 .3 .3 .3 .3 .3 .3 .3 .3 .3 .3 .3
.3 .3 .3 .3 .3 .3 .3 .3 .3 .3 .3 .3 .3 .3 .3 .4 .4 .3 .3 .3 .3 .3 .3 .3 .4 .4 .4 .3 .3 .3 .3 .3 .3 .3 .3 .3
.3 .3 .3 .3 .3 .3 .3 .3 .3 .3 .4 .4 .4 .4 .4 .4 .4 .4 .4 .4 .4 .4 .4 .4 .4 .5 .4 .4 .4 .4 .4 .3 .3 .3 .3 .4
.4 .4 .4 .4 .4 .4 .4 .4 .4 .4 .4 .4 .5 .5 .4 .4 .4 .4 .5 .4 .4 .4 .4 .4 .5 .5 .5 .5 .4 .4 .4 .4 .4 .4 .4 .4
.4 .4 .4 .5 .5 .5 .5 .4 .5 .5 .5 .5 .5 .4 .4 .4 .4 .4 .4 .4 .4 .4 .4 .4 .4 .4 .4 .5 .5 .5 .4 .4 .4 .4 .4 .4
.4 .4 .4 .4 .4 .4 .4 .5 .5 .4 .4 .4 .4 .4 .4 .4 .4 .4 .4 .4 .4 .5 .5 .5 .5 .5 .5 .5 .4 .4 .4 .4 .4 .4 .4 .4

Figure 40. ATOVS mean daily count. MAY 2004
NOAA16, using all observations
Global average number of observations in 24 hours = 535097



348	361	376	394	406	409	421	428	436	403	428	442	440	437	411	416	422	422	411	395	376	370	355	340	320	307	300	288	279	280	278	290	299	307	320	332
1055	1118	1159	1196	1206	1238	1256	1270	1296	1246	1295	1311	1263	1021	959	1259	1283	1258	1228	1154	1073	1029	992	975	948	920	884	850	845	854	864	877	883	900	934	986
820	941	1041	1112	1117	1109	1099	1098	1095	1101	1098	1103	1106	1035	1089	1148	1149	1101	1003	870	769	763	821	902	930	931	928	942	971	1007	1027	980	877	790	732	737
587	728	890	1013	1041	1034	962	873	889	968	1019	1043	1041	1050	1057	1071	1070	1020	870	686	636	744	881	942	907	881	924	969	992	1003	1010	987	877	744	635	563
569	682	866	976	963	981	966	928	933	934	979	1040	1032	1029	1010	1036	1047	949	745	895	646	824	937	962	941	932	944	959	951	944	966	987	947	879	707	544
861	891	935	1035	988	983	933	908	971	923	961	1022	1003	1050	979	1024	1042	861	674	560	683	907	926	962	952	881	917	848	851	869	818	888	858	860	749	654
850	943	999	1082	953	994	931	860	890	901	863	952	921	1047	955	1000	1031	781	606	560	724	960	902	905	882	687	669	516	585	637	665	785	878	981	777	574
691	832	949	1022	854	928	847	744	817	770	648	794	837	938	908	977	1009	747	566	594	673	825	824	716	474	422	410	291	543	680	566	747	740	852	755	492
613	727	895	965	902	1002	920	809	781	747	666	749	707	716	778	905	929	659	511	574	611	754	795	652	450	402	376	392	632	695	563	584	482	505	519	457
671	804	945	972	950	1003	1022	983	877	1013	953	850	855	920	921	961	869	639	497	641	834	892	893	841	685	646	602	694	791	812	728	619	529	521	596	627
619	820	953	915	1013	1005	1033	992	823	974	999	983	997	916	1005	949	739	596	494	749	973	859	935	935	888	726	706	879	927	909	1017	868	928	803	818	720
597	811	992	956	1046	1003	1035	1030	888	961	906	1000	1050	952	1040	987	728	580	557	821	970	848	938	945	1000	999	794	890	922	929	1017	956	1008	964	894	777
598	754	942	976	1034	1020	1032	1003	924	988	963	1016	1031	950	1022	948	673	545	615	854	996	923	1001	995	1030	1056	935	969	1004	1012	1051	995	1023	989	961	831
673	719	906	1025	1067	1066	1036	1003	981	972	997	1030	1028	1037	1038	895	639	581	757	940	1043	1041	1046	1061	1082	1064	1022	1032	1037	1044	1049	1041	1035	1029	1014	864
773	725	836	973	1066	1072	1063	1052	1022	1002	1018	1041	1070	1065	996	813	645	680	863	1018	1090	1088	1085	1090	1093	1075	1054	1071	1076	1079	1076	1057	1052	1056	1061	949
958	856	838	897	1000	1072	1110	1121	1110	1094	1062	986	1063	1013	927	808	781	871	1008	1102	1152	1153	1133	1101	1126	1087	1147	1127	1088	1063	1079	1062	1038	1055	1109	1064
1061	932	845	820	861	816	863	900	889	847	764	747	918	902	920	827	799	783	615	500	526	520	373	482	865	899	540	220	341	375	474	844	912	904	1004	1109
283	281	234	248	269	300	300	241	139	242	285	285	270	283	299	288	256	191	138	143	198	154	56	27	22	16	25	41	97	184	280	308	329	317	352	307

Figure 41. ATOVS MEAN O-B brightness temperature differences (deg C). MAY 2004
Channel: HIRS8 (Surface)
NOAA16, using all observations

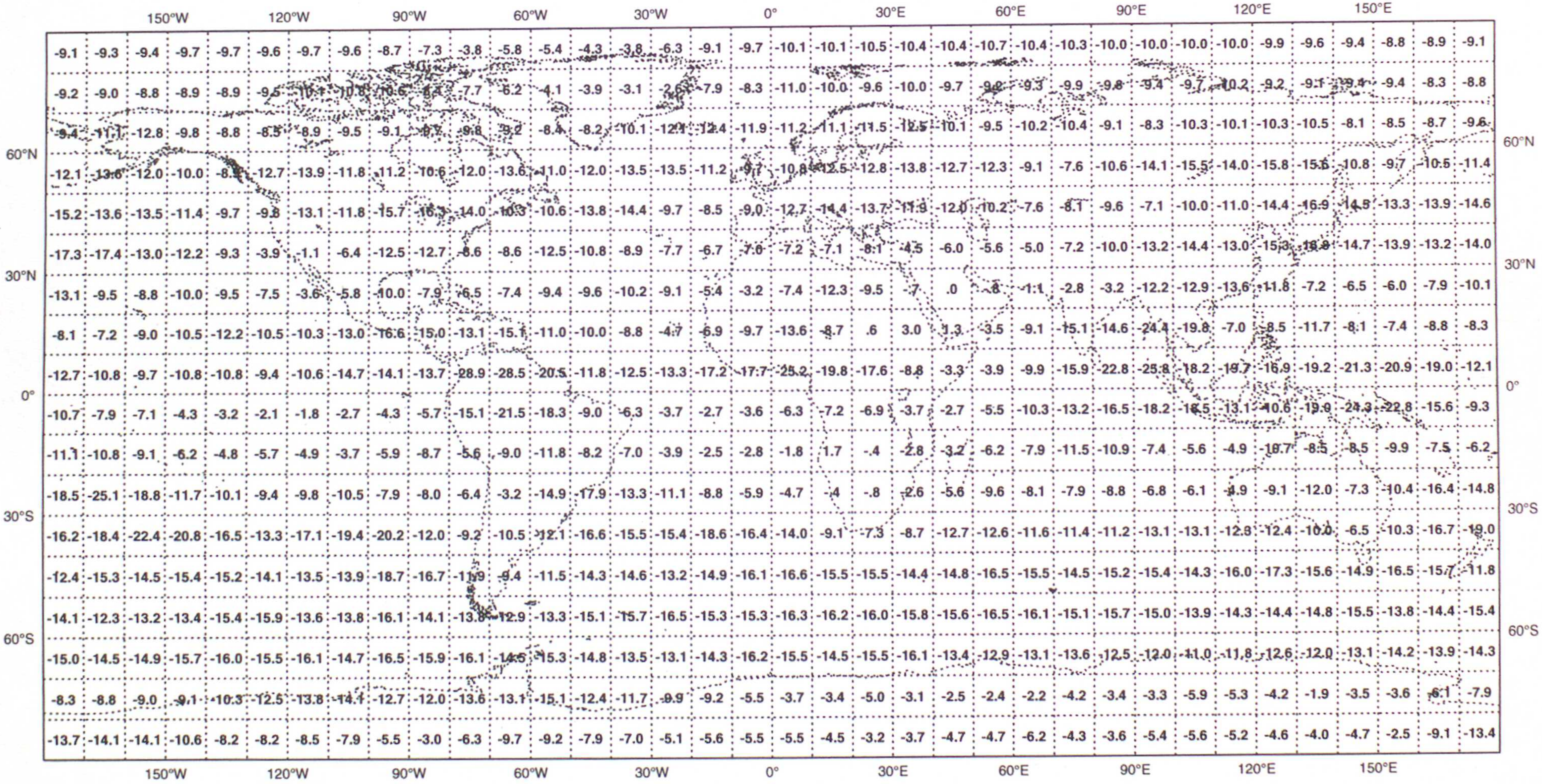
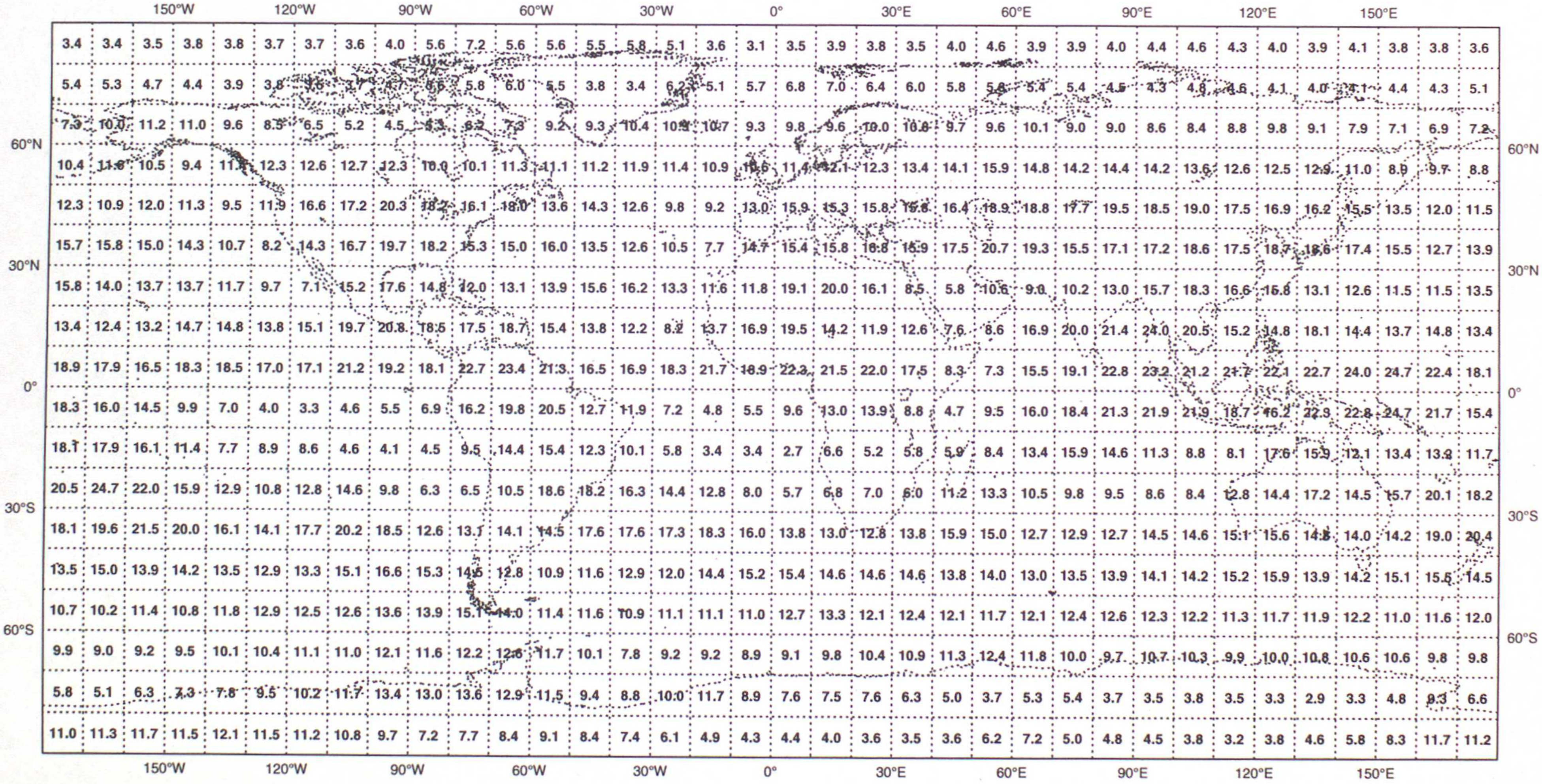

150°W 120°W 90°W 60°W 30°W 0° 30°E 60°E 90°E 120°E 150°E
60°N 30°N 0° 30°S 60°S
-9.1 -9.3 -9.4 -9.7 -9.7 -9.6 -9.7 -9.6 -8.7 -7.3 -3.8 -5.8 -5.4 -4.3 -3.8 -6.3 -9.1 -9.7 -10.1 -10.1 -10.5 -10.4 -10.4 -10.7 -10.4 -10.3 -10.0 -10.0 -10.0 -10.0 -9.9 -9.6 -9.4 -8.8 -8.9 -9.1
-9.2 -9.0 -8.8 -8.9 -8.9 -9.5 -10.1 -10.8 -10.6 -8.4 -7.7 -6.2 -4.1 -3.9 -3.1 -2.6 -7.9 -8.3 -11.0 -10.0 -9.6 -10.0 -9.7 -9.2 -9.3 -9.9 -9.8 -9.4 -9.7 -10.2 -9.2 -9.1 -9.4 -9.4 -8.3 -8.8
-9.4 -11.1 -12.8 -9.8 -8.8 -8.5 -8.9 -9.5 -9.1 -9.7 -9.8 -9.2 -8.4 -8.2 -10.1 -12.1 -12.4 -11.9 -11.2 -11.1 -11.5 -12.5 -10.1 -9.5 -10.2 -10.4 -9.1 -8.3 -10.3 -10.1 -10.3 -10.5 -8.1 -8.5 -8.7 -9.6
-12.1 -13.6 -12.0 -10.0 -8.8 -12.7 -13.9 -11.8 -11.2 -10.6 -12.0 -13.6 -11.0 -12.0 -13.5 -13.5 -11.2 -9.7 -10.8 -12.5 -12.8 -13.8 -12.7 -12.3 -9.1 -7.6 -10.6 -14.1 -15.5 -14.0 -15.8 -15.6 -10.8 -9.7 -10.5 -11.4
-15.2 -13.6 -13.5 -11.4 -9.7 -9.8 -13.1 -11.8 -15.7 -16.3 -14.0 -10.3 -10.6 -13.8 -14.4 -9.7 -8.5 -9.0 -12.7 -14.4 -13.7 -11.9 -12.0 -10.2 -7.6 -8.1 -9.6 -7.1 -10.0 -11.0 -14.4 -16.9 -14.5 -13.3 -13.9 -14.6
-17.3 -17.4 -13.0 -12.2 -9.3 -3.9 -1.1 -6.4 -12.5 -12.7 -8.6 -8.6 -12.5 -10.8 -8.9 -7.7 -6.7 -7.6 -7.2 -7.1 -8.1 -4.5 -6.0 -5.6 -5.0 -7.2 -10.0 -13.2 -14.4 -13.0 -15.3 -16.8 -14.7 -13.9 -13.2 -14.0
-13.1 -9.5 -8.8 -10.0 -9.5 -7.5 -3.6 -5.8 -10.0 -7.9 -6.5 -7.4 -9.4 -9.6 -10.2 -9.1 -5.4 -3.2 -7.4 -12.3 -9.5 -.7 .0 -.8 -1.1 -2.8 -3.2 -12.2 -12.9 -13.6 -11.8 -7.2 -6.5 -6.0 -7.9 -10.1
-8.1 -7.2 -9.0 -10.5 -12.2 -10.5 -10.3 -13.0 -16.6 -15.0 -13.1 -15.1 -11.0 -10.0 -8.8 -4.7 -6.9 -9.7 -13.6 -8.7 .6 3.0 1.3 -3.5 -9.1 -15.1 -14.6 -24.4 -19.8 -7.0 -8.5 -11.7 -8.1 -7.4 -8.8 -8.3
-12.7 -10.8 -9.7 -10.8 -10.8 -9.4 -10.6 -14.7 -14.1 -13.7 -28.9 -28.5 -20.5 -11.8 -12.5 -13.3 -17.2 -17.7 -25.2 -19.8 -17.6 -8.8 -3.3 -3.9 -9.9 -15.9 -22.8 -25.8 -18.2 -19.7 -16.9 -19.2 -21.3 -20.9 -19.0 -12.1
-10.7 -7.9 -7.1 -4.3 -3.2 -2.1 -1.8 -2.7 -4.3 -5.7 -15.1 -21.5 -18.3 -9.0 -6.3 -3.7 -2.7 -3.6 -6.3 -7.2 -6.9 -3.7 -2.7 -5.5 -10.3 -13.2 -16.5 -18.2 -18.5 -13.1 -10.6 -19.9 -24.3 -22.8 -15.6 -9.3
-11.1 -10.8 -9.1 -6.2 -4.8 -5.7 -4.9 -3.7 -5.9 -8.7 -5.6 -9.0 -11.8 -8.2 -7.0 -3.9 -2.5 -2.8 -1.8 1.7 -.4 -2.8 -3.2 -6.2 -7.9 -11.5 -10.9 -7.4 -5.6 -4.9 -10.7 -8.5 -8.5 -9.9 -7.5 -6.2
-18.5 -25.1 -18.8 -11.7 -10.1 -9.4 -9.8 -10.5 -7.9 -8.0 -6.4 -3.2 -14.9 -17.9 -13.3 -11.1 -8.8 -5.9 -4.7 -.4 -.8 -2.6 -5.6 -9.6 -8.1 -7.9 -8.8 -6.8 -6.1 -4.9 -9.1 -12.0 -7.3 -10.4 -16.4 -14.8
-16.2 -18.4 -22.4 -20.8 -16.5 -13.3 -17.1 -19.4 -20.2 -12.0 -9.2 -10.5 -12.1 -16.6 -15.5 -15.4 -18.6 -16.4 -14.0 -9.1 -7.3 -8.7 -12.7 -12.6 -11.6 -11.4 -11.2 -13.1 -13.1 -12.8 -12.4 -10.0 -6.5 -10.3 -16.7 -19.0
-12.4 -15.3 -14.5 -15.4 -15.2 -14.1 -13.5 -13.9 -18.7 -16.7 -11.9 -9.4 -11.5 -14.3 -14.6 -13.2 -14.9 -16.1 -16.6 -15.5 -15.5 -14.4 -14.8 -16.5 -15.5 -14.5 -15.2 -15.4 -14.3 -16.0 -17.3 -15.6 -14.9 -16.5 -15.7 -11.8
-14.1 -12.3 -13.2 -13.4 -15.4 -15.9 -13.6 -13.8 -16.1 -14.1 -13.8 -12.9 -13.3 -15.1 -15.7 -16.5 -15.3 -15.3 -16.3 -16.2 -16.0 -15.8 -15.6 -16.5 -16.1 -15.1 -15.7 -15.0 -13.9 -14.3 -14.4 -14.8 -15.5 -13.8 -14.4 -15.4
-15.0 -14.5 -14.9 -15.7 -16.0 -15.5 -16.1 -14.7 -16.5 -15.9 -16.1 -14.5 -15.3 -14.8 -13.5 -13.1 -14.3 -16.2 -15.5 -14.5 -15.5 -16.1 -13.4 -12.9 -13.1 -13.6 -12.5 -12.0 -11.0 -11.8 -12.6 -12.0 -13.1 -14.2 -13.9 -14.3
-8.3 -8.8 -9.0 -9.1 -10.3 -12.5 -13.8 -14.1 -12.7 -12.0 -13.6 -13.1 -15.1 -12.4 -11.7 -9.9 -9.2 -5.5 -3.7 -3.4 -5.0 -3.1 -2.5 -2.4 -2.2 -4.2 -3.4 -3.3 -5.9 -5.3 -4.2 -1.9 -3.5 -3.6 -6.1 -7.9
-13.7 -14.1 -14.1 -10.6 -8.2 -8.2 -8.5 -7.9 -5.5 -3.0 -6.3 -9.7 -9.2 -7.9 -7.0 -5.1 -5.6 -5.5 -5.5 -4.5 -3.2 -3.7 -4.7 -4.7 -6.2 -4.3 -3.6 -5.4 -5.6 -5.2 -4.6 -4.0 -4.7 -2.5 -9.1 -13.4

Figure 42. ATOVS SD O-B brightness temperature differences (deg C). MAY 2004
Channel: HIRS8 (Surface)
NOAA16, using all observations



3.4	3.4	3.5	3.8	3.8	3.7	3.7	3.6	4.0	5.6	7.2	5.6	5.6	5.5	5.8	5.1	3.6	3.1	3.5	3.9	3.8	3.5	4.0	4.6	3.9	3.9	4.0	4.4	4.6	4.3	4.0	3.9	4.1	3.8	3.8	3.6
5.4	5.3	4.7	4.4	3.9	3.8	3.6	3.7	4.7	5.6	5.8	6.0	5.5	3.8	3.4	6.2	5.1	5.7	6.8	7.0	6.4	6.0	5.8	5.8	5.4	5.4	4.5	4.3	4.8	4.6	4.1	4.0	4.1	4.4	4.3	5.1
7.3	10.0	11.2	11.0	9.6	8.5	6.5	5.2	4.5	5.3	6.2	7.3	9.2	9.3	10.4	10.9	10.7	9.3	9.8	9.6	10.0	10.8	9.7	9.6	10.1	9.0	9.0	8.6	8.4	8.8	9.8	9.1	7.9	7.1	6.9	7.2
10.4	11.6	10.5	9.4	[illegible]	12.3	12.6	12.7	12.3	10.0	10.1	11.3	11.1	11.2	11.9	11.4	10.9	10.6	11.4	12.1	12.3	13.4	14.1	15.9	14.8	14.2	14.4	14.2	13.6	12.6	12.5	12.9	11.0	8.9	9.7	8.8
12.3	10.9	12.0	11.3	9.5	11.9	16.6	17.2	20.3	18.2	16.1	18.0	13.6	14.3	12.6	9.8	9.2	13.0	15.9	15.3	15.8	15.6	16.4	18.9	18.8	17.7	19.5	18.5	19.0	17.5	16.9	16.2	15.5	13.5	12.0	11.5
15.7	15.8	15.0	14.3	10.7	8.2	14.3	16.7	19.7	18.2	15.3	15.0	16.0	13.5	12.6	10.5	7.7	14.7	15.4	15.8	16.8	15.9	17.5	20.7	19.3	15.5	17.1	17.2	18.6	17.5	18.7	18.6	17.4	15.5	12.7	13.9
15.8	14.0	13.7	13.7	11.7	9.7	7.1	15.2	17.6	14.8	12.0	13.1	13.9	15.6	16.2	13.3	11.6	11.8	19.1	20.0	16.1	8.5	5.8	10.6	9.0	10.2	13.0	15.7	18.3	16.6	16.8	13.1	12.6	11.5	11.5	13.5
13.4	12.4	13.2	14.7	14.8	13.8	15.1	19.7	20.8	18.5	17.5	18.7	15.4	13.8	12.2	8.2	13.7	16.9	19.5	14.2	11.9	12.6	7.6	8.6	16.9	20.0	21.4	24.0	20.5	15.2	14.8	18.1	14.4	13.7	14.8	13.4
18.9	17.9	16.5	18.3	18.5	17.0	17.1	21.2	19.2	18.1	22.7	23.4	21.3	16.5	16.9	18.3	21.7	18.9	22.3	21.5	22.0	17.5	8.3	7.3	15.5	19.1	22.8	23.2	21.2	21.7	22.1	22.7	24.0	24.7	22.4	18.1
18.3	16.0	14.5	9.9	7.0	4.0	3.3	4.6	5.5	6.9	16.2	19.8	20.5	12.7	11.9	7.2	4.8	5.5	9.6	13.0	13.9	8.8	4.7	9.5	16.0	18.4	21.3	21.9	21.9	18.7	16.2	22.3	22.8	24.7	21.7	15.4
18.1	17.9	16.1	11.4	7.7	8.9	8.6	4.6	4.1	4.5	9.5	14.4	15.4	12.3	10.1	5.8	3.4	3.4	2.7	6.6	5.2	5.8	5.9	8.4	13.4	15.9	14.6	11.3	8.8	8.1	17.6	15.9	12.1	13.4	13.8	11.7
20.5	24.7	22.0	15.9	12.9	10.8	12.8	14.6	9.8	6.3	6.5	10.5	18.6	18.2	16.3	14.4	12.8	8.0	5.7	6.8	7.0	6.0	11.2	13.3	10.5	9.8	9.5	8.6	8.4	12.8	14.4	17.2	14.5	15.7	20.1	18.2
18.1	19.6	21.5	20.0	16.1	14.1	17.7	20.2	18.5	12.6	13.1	14.1	14.5	17.6	17.6	17.3	18.3	16.0	13.8	13.0	12.8	13.8	15.9	15.0	12.7	12.9	12.7	14.5	14.6	15.1	15.6	14.8	14.0	14.2	19.0	20.4
13.5	15.0	13.9	14.2	13.5	12.9	13.3	15.1	16.6	15.3	14.5	12.8	10.9	11.6	12.9	12.0	14.4	15.2	15.4	14.6	14.6	14.6	13.8	14.0	13.0	13.5	13.9	14.1	14.2	15.2	15.9	13.9	14.2	15.1	15.5	14.5
10.7	10.2	11.4	10.8	11.8	12.9	12.5	12.6	13.6	13.9	15.1	14.0	11.4	11.6	10.9	11.1	11.1	11.0	12.7	13.3	12.1	12.4	12.1	11.7	12.1	12.4	12.6	12.3	12.2	11.3	11.7	11.9	12.2	11.0	11.6	12.0
9.9	9.0	9.2	9.5	10.1	10.4	11.1	11.0	12.1	11.6	12.2	12.6	11.7	10.1	7.8	9.2	9.2	8.9	9.1	9.8	10.4	10.9	11.3	12.4	11.8	10.0	9.7	10.7	10.3	9.9	10.0	10.8	10.6	10.6	9.8	9.8
5.8	5.1	6.3	7.3	7.8	9.5	10.2	11.7	13.4	13.0	13.6	12.9	11.5	9.4	8.8	10.0	11.7	8.9	7.6	7.5	7.6	6.3	5.0	3.7	5.3	5.4	3.7	3.5	3.8	3.5	3.3	2.9	3.3	4.8	9.3	6.6
11.0	11.3	11.7	11.5	12.1	11.5	11.2	10.8	9.7	7.2	7.7	8.4	9.1	8.4	7.4	6.1	4.9	4.3	4.4	4.0	3.6	3.5	3.6	6.2	7.2	5.0	4.8	4.5	3.8	3.2	3.8	4.6	5.8	8.3	11.7	11.2

Figure 43. ATOVS MEAN O-B brightness temperature differences (deg C). MAY 2004
Channel: HIRS15 (700 hPa)
NOAA16, using all observations

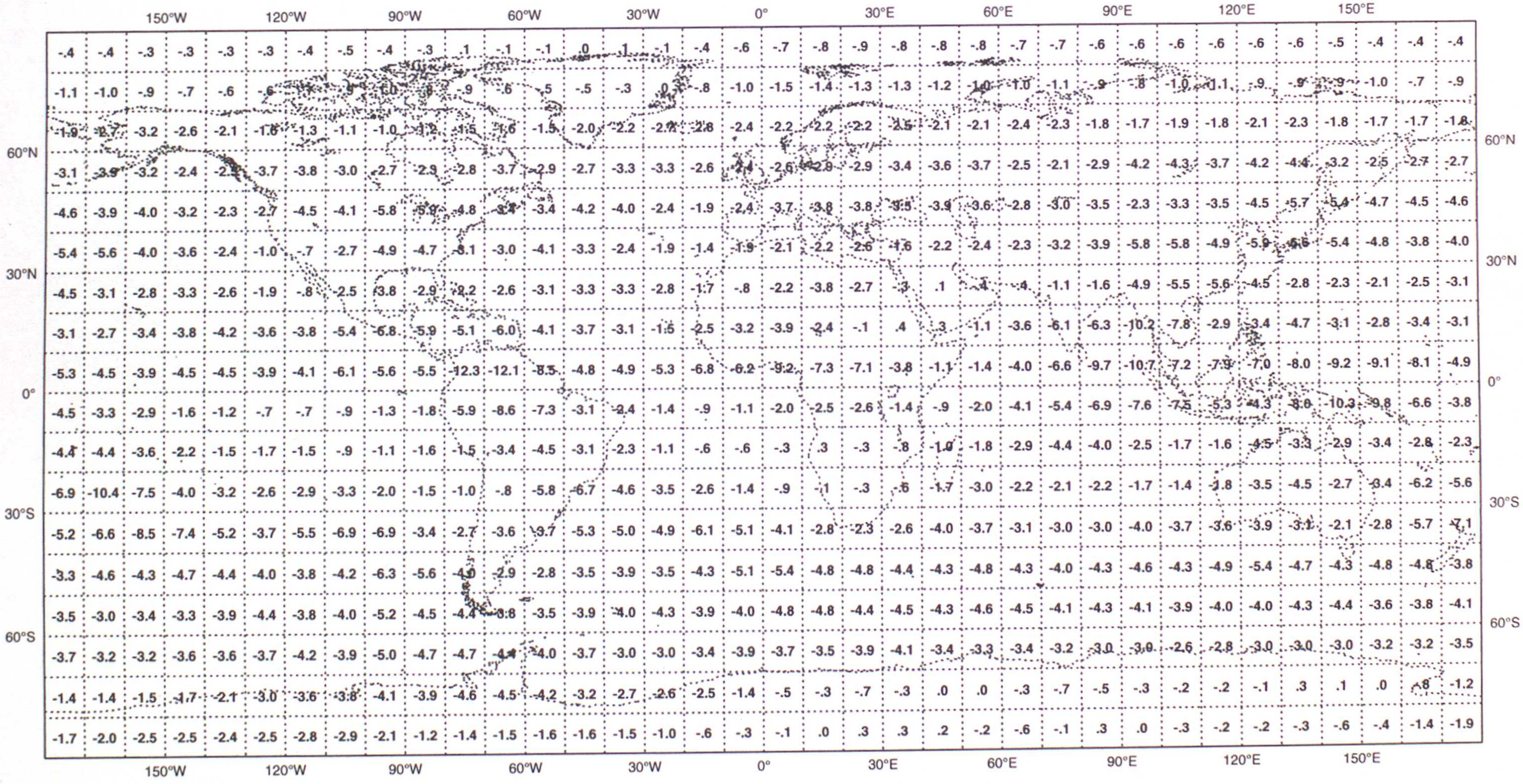
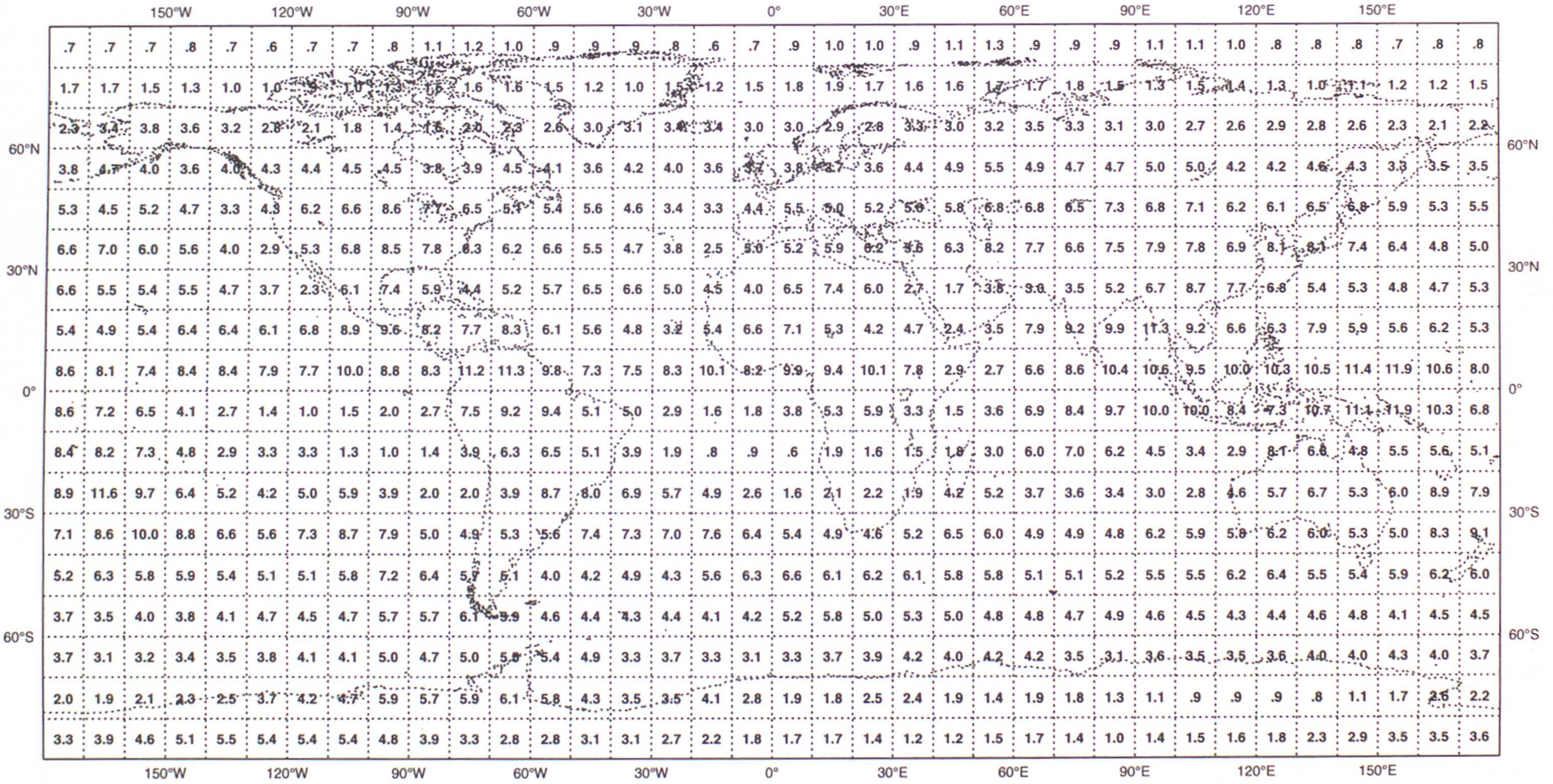

150°W
120°W
90°W
60°W
30°W
0°
30°E
60°E
90°E
120°E
150°E
60°N
30°N
0°
30°S
60°S

Figure 44. ATOVS SD O-B brightness temperature differences (deg C). MAY 2004
Channel: HIRS15 (700 hPa)
NOAA16, using all observations



.7	.7	.7	.8	.7	.6	.7	.7	.8	1.1	1.2	1.0	.9	.9	.9	.8	.6	.7	.9	1.0	1.0	.9	1.1	1.3	.9	.9	.9	1.1	1.1	1.0	.8	.8	.8	.7	.8	.8
1.7	1.7	1.5	1.3	1.0	1.0	.9	1.0	1.3	1.6	1.6	1.6	1.5	1.2	1.0	1.5	1.2	1.5	1.8	1.9	1.7	1.6	1.6	1.7	1.7	1.8	1.5	1.3	1.5	1.4	1.3	1.0	1.1	1.2	1.2	1.5
2.3	3.4	3.8	3.6	3.2	2.8	2.1	1.8	1.4	1.6	2.0	2.3	2.6	3.0	3.1	3.4	3.4	3.0	3.0	2.9	2.8	3.3	3.0	3.2	3.5	3.3	3.1	3.0	2.7	2.6	2.9	2.8	2.6	2.3	2.1	2.2
3.8	4.7	4.0	3.6	4.0	4.3	4.4	4.5	4.5	3.8	3.9	4.5	4.1	3.6	4.2	4.0	3.6	3.7	3.8	2.7	3.6	4.4	4.9	5.5	4.9	4.7	4.7	5.0	5.0	4.2	4.2	4.6	4.3	3.3	3.5	3.5
5.3	4.5	5.2	4.7	3.3	4.3	6.2	6.6	8.6	7.7	6.5	5.1	5.4	5.6	4.6	3.4	3.3	4.4	5.5	5.0	5.2	5.6	5.8	6.8	6.8	6.5	7.3	6.8	7.1	6.2	6.1	6.5	6.8	5.9	5.3	5.5
6.6	7.0	6.0	5.6	4.0	2.9	5.3	6.8	8.5	7.8	6.3	6.2	6.6	5.5	4.7	3.8	2.5	5.0	5.2	5.9	6.2	5.6	6.3	8.2	7.7	6.6	7.5	7.9	7.8	6.9	8.1	8.1	7.4	6.4	4.8	5.0
6.6	5.5	5.4	5.5	4.7	3.7	2.3	6.1	7.4	5.9	4.4	5.2	5.7	6.5	6.6	5.0	4.5	4.0	6.5	7.4	6.0	2.7	1.7	3.8	3.0	3.5	5.2	6.7	8.7	7.7	6.8	5.4	5.3	4.8	4.7	5.3
5.4	4.9	5.4	6.4	6.4	6.1	6.8	8.9	9.6	8.2	7.7	8.3	6.1	5.6	4.8	3.2	5.4	6.6	7.1	5.3	4.2	4.7	2.4	3.5	7.9	9.2	9.9	11.3	9.2	6.6	6.3	7.9	5.9	5.6	6.2	5.3
8.6	8.1	7.4	8.4	8.4	7.9	7.7	10.0	8.8	8.3	11.2	11.3	9.8	7.3	7.5	8.3	10.1	8.2	9.9	9.4	10.1	7.8	2.9	2.7	6.6	8.6	10.4	10.6	9.5	10.0	10.3	10.5	11.4	11.9	10.6	8.0
8.6	7.2	6.5	4.1	2.7	1.4	1.0	1.5	2.0	2.7	7.5	9.2	9.4	5.1	5.0	2.9	1.6	1.8	3.8	5.3	5.9	3.3	1.5	3.6	6.9	8.4	9.7	10.0	10.0	8.4	7.3	10.7	11.1	11.9	10.3	6.8
8.4	8.2	7.3	4.8	2.9	3.3	3.3	1.3	1.0	1.4	3.9	6.3	6.5	5.1	3.9	1.9	.8	.9	.6	1.9	1.6	1.5	1.8	3.0	6.0	7.0	6.2	4.5	3.4	2.9	8.1	6.8	4.8	5.5	5.6	5.1
8.9	11.6	9.7	6.4	5.2	4.2	5.0	5.9	3.9	2.0	2.0	3.9	8.7	8.0	6.9	5.7	4.9	2.6	1.6	2.1	2.2	1.9	4.2	5.2	3.7	3.6	3.4	3.0	2.8	4.6	5.7	6.7	5.3	6.0	8.9	7.9
7.1	8.6	10.0	8.8	6.6	5.6	7.3	8.7	7.9	5.0	4.9	5.3	5.6	7.4	7.3	7.0	7.6	6.4	5.4	4.9	4.6	5.2	6.5	6.0	4.9	4.9	4.8	6.2	5.9	5.8	6.2	6.0	5.3	5.0	8.3	9.1
5.2	6.3	5.8	5.9	5.4	5.1	5.1	5.8	7.2	6.4	5.7	5.1	4.0	4.2	4.9	4.3	5.6	6.3	6.6	6.1	6.2	6.1	5.8	5.8	5.1	5.1	5.2	5.5	5.5	6.2	6.4	5.5	5.4	5.9	6.2	6.0
3.7	3.5	4.0	3.8	4.1	4.7	4.5	4.7	5.7	5.7	6.1	3.9	4.6	4.4	4.3	4.4	4.1	4.2	5.2	5.8	5.0	5.3	5.0	4.8	4.8	4.7	4.9	4.6	4.5	4.3	4.4	4.6	4.8	4.1	4.5	4.5
3.7	3.1	3.2	3.4	3.5	3.8	4.1	4.1	5.0	4.7	5.0	5.5	5.4	4.9	3.3	3.7	3.3	3.1	3.3	3.7	3.9	4.2	4.0	4.2	4.2	3.5	3.1	3.6	3.5	3.5	3.6	4.0	4.0	4.3	4.0	3.7
2.0	1.9	2.1	2.3	2.5	3.7	4.2	4.7	5.9	5.7	5.9	6.1	5.8	4.3	3.5	3.5	4.1	2.8	1.9	1.8	2.5	2.4	1.9	1.4	1.9	1.8	1.3	1.1	.9	.9	.9	.8	1.1	1.7	2.6	2.2
3.3	3.9	4.6	5.1	5.5	5.4	5.4	5.4	4.8	3.9	3.3	2.8	2.8	3.1	3.1	2.7	2.2	1.8	1.7	1.7	1.4	1.2	1.2	1.5	1.7	1.4	1.0	1.4	1.5	1.6	1.8	2.3	2.9	3.5	3.5	3.6

Figure 45. ATOVS MEAN O-B brightness temperature differences (deg C). MAY 2004
Channel: HIRS11 (500 - 700 hPa)
NOAA16, using all observations

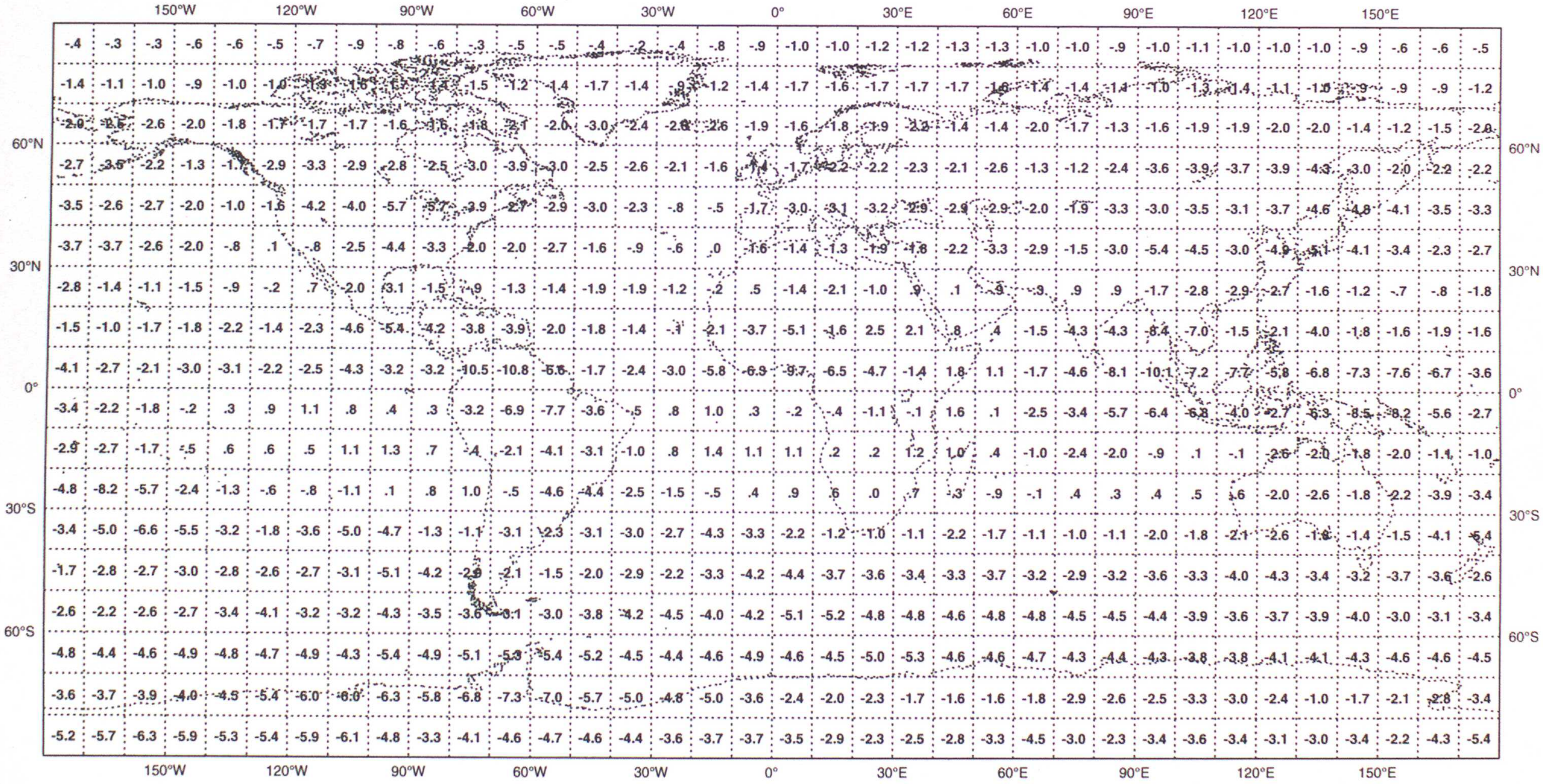
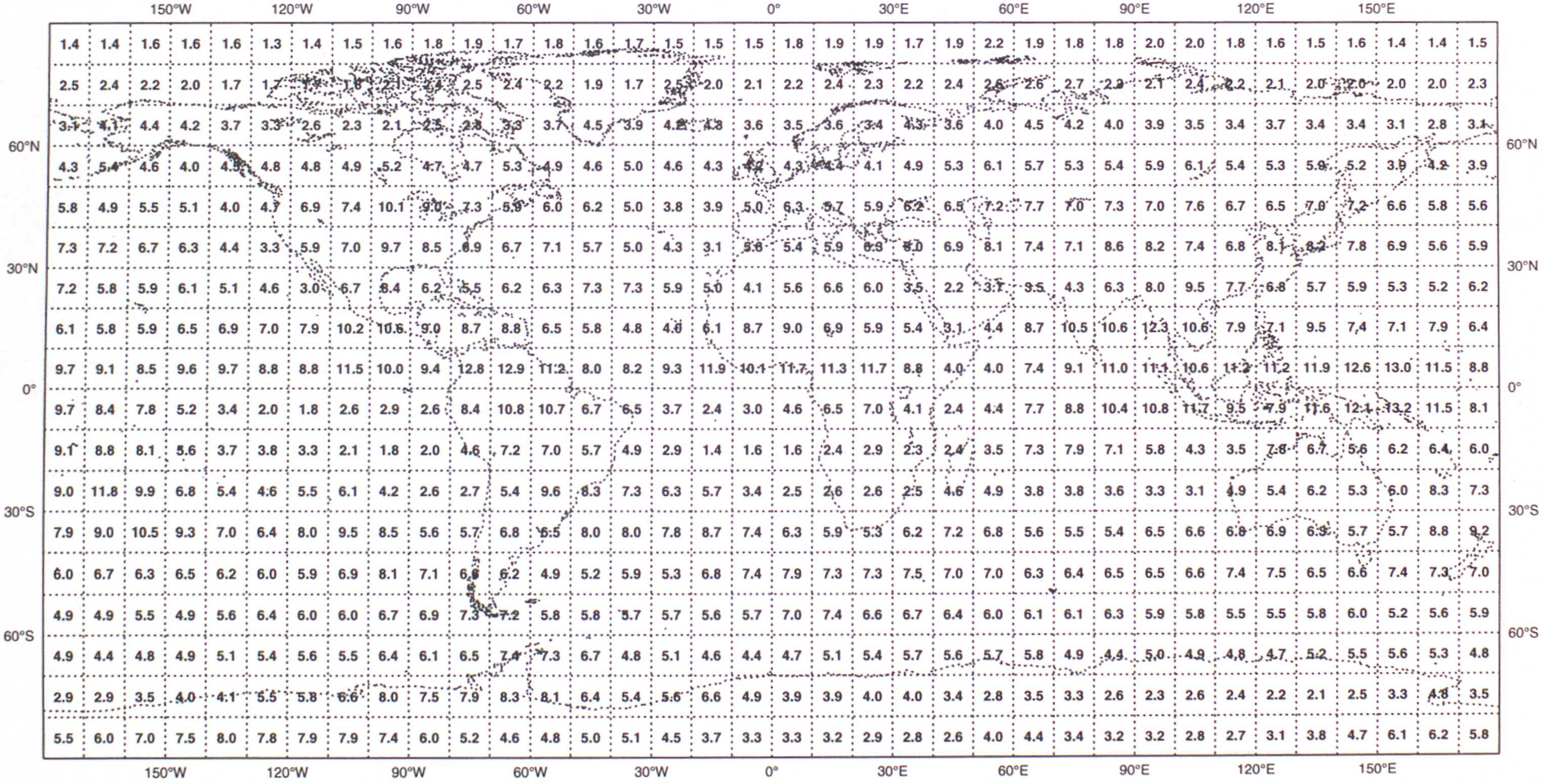
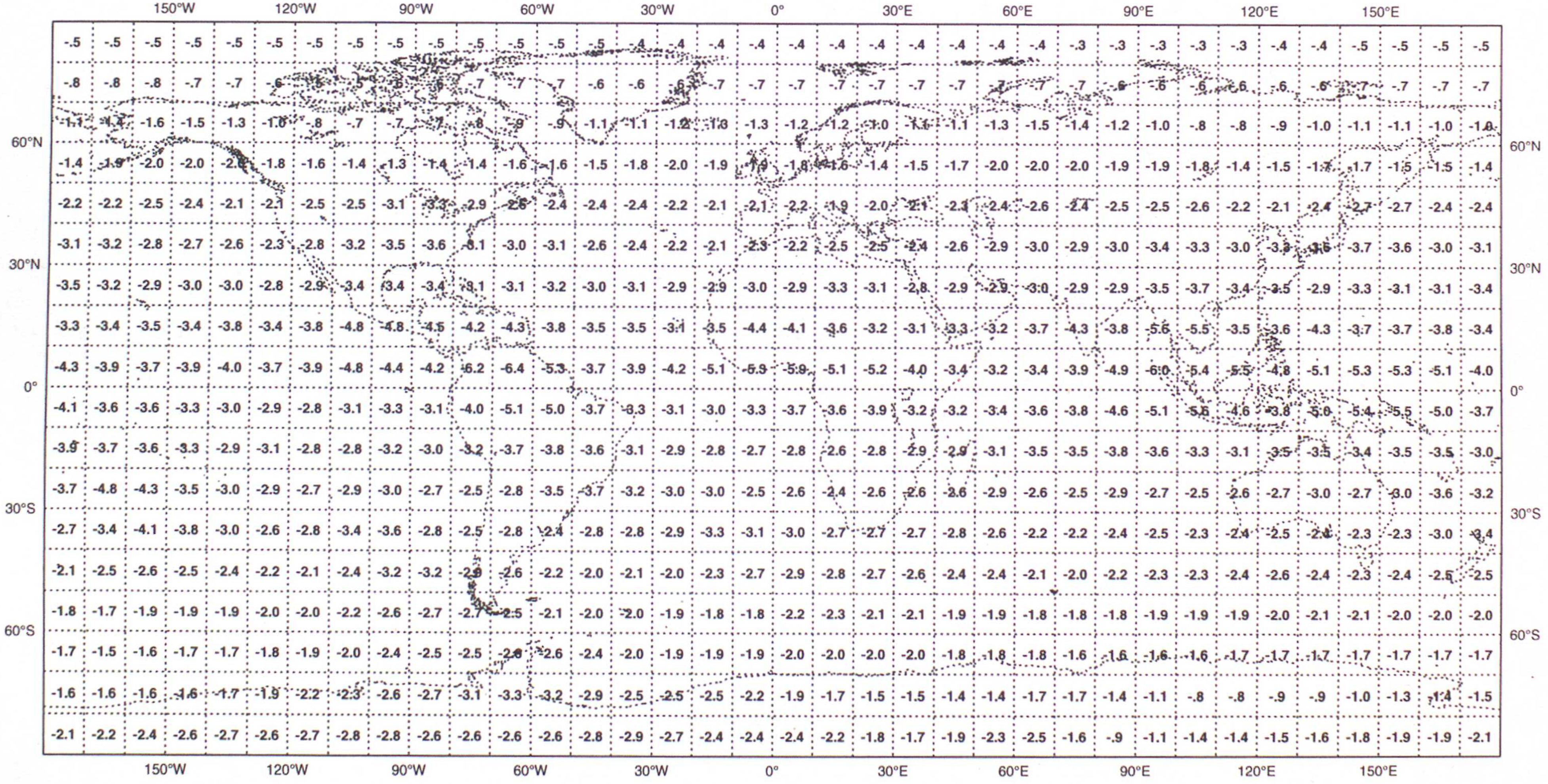

150°W
120°W
90°W
60°W
30°W
0°
30°E
60°E
90°E
120°E
150°E
60°N
30°N
0°
30°S
60°S

Figure 46. ATOVS SD O-B brightness temperature differences (deg C). MAY 2004
Channel: HIRS11 (500 - 700 hPa)
NOAA16, using all observations



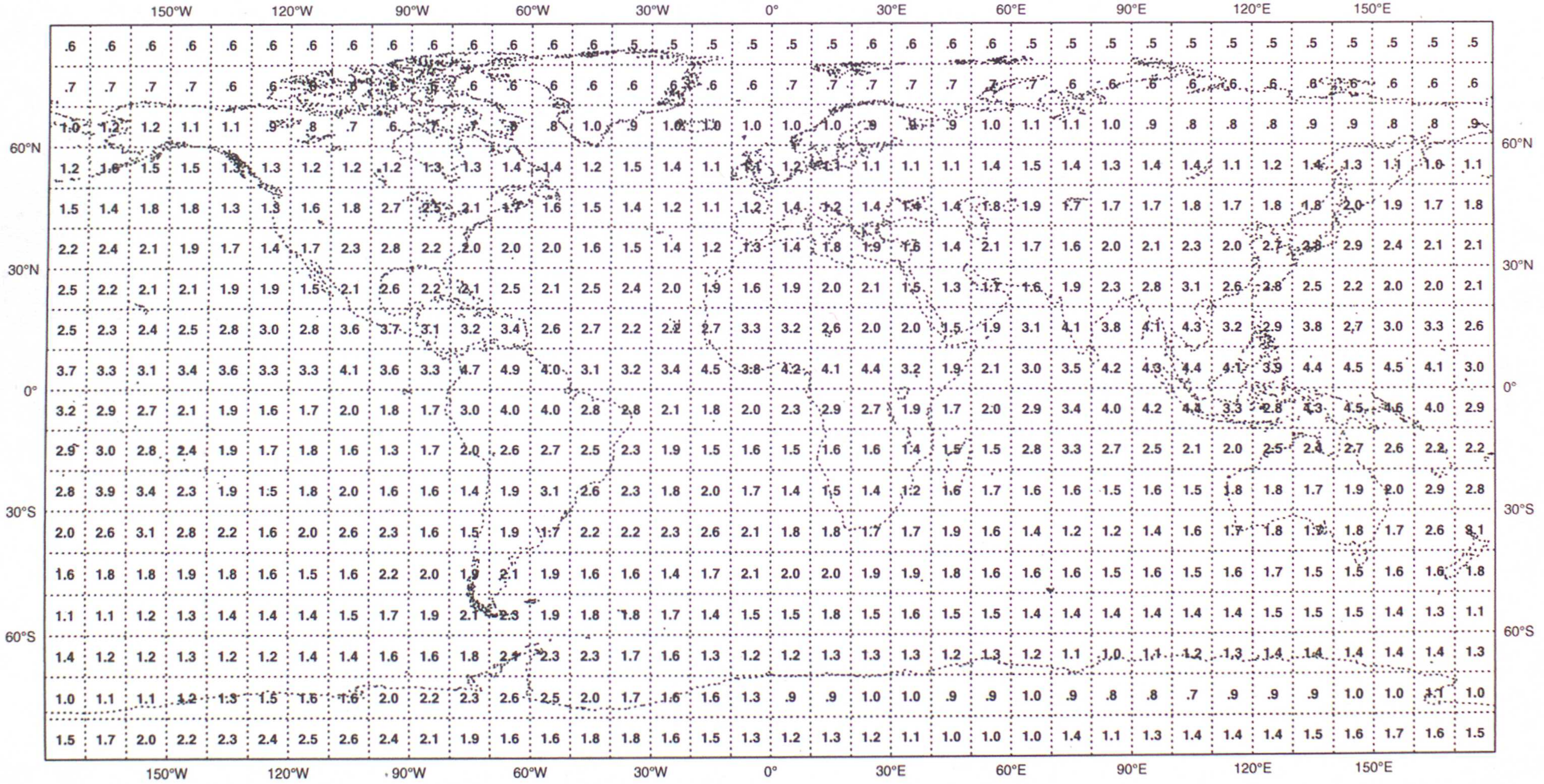
1.4	1.4	1.6	1.6	1.6	1.3	1.4	1.5	1.6	1.8	1.9	1.7	1.8	1.6	1.7	1.5	1.5	1.5	1.8	1.9	1.9	1.7	1.9	2.2	1.9	1.8	1.8	2.0	2.0	1.8	1.6	1.5	1.6	1.4	1.4	1.5
2.5	2.4	2.2	2.0	1.7	1.7	1.7	1.8	2.1	2.4	2.5	2.4	2.2	1.9	1.7	2.5	2.0	2.1	2.2	2.4	2.3	2.2	2.4	2.6	2.6	2.7	2.3	2.1	2.4	2.2	2.1	2.0	2.0	2.0	2.0	2.3
3.1	4.1	4.4	4.2	3.7	3.3	2.6	2.3	2.1	2.5	2.8	3.3	3.7	4.5	3.9	4.2	4.3	3.6	3.5	3.6	3.4	4.3	3.6	4.0	4.5	4.2	4.0	3.9	3.5	3.4	3.7	3.4	3.4	3.1	2.8	3.1
4.3	5.4	4.6	4.0	4.5	4.8	4.8	4.9	5.2	4.7	4.7	5.3	4.9	4.6	5.0	4.6	4.3	4.2	4.3	4.4	4.1	4.9	5.3	6.1	5.7	5.3	5.4	5.9	6.1	5.4	5.3	5.9	5.2	3.9	4.2	3.9
5.8	4.9	5.5	5.1	4.0	4.7	6.9	7.4	10.1	9.0	7.3	5.9	6.0	6.2	5.0	3.8	3.9	5.0	6.3	5.7	5.9	6.2	6.5	7.2	7.7	7.0	7.3	7.0	7.6	6.7	6.5	7.0	7.2	6.6	5.8	5.6
7.3	7.2	6.7	6.3	4.4	3.3	5.9	7.0	9.7	8.5	6.9	6.7	7.1	5.7	5.0	4.3	3.1	5.6	5.4	5.9	6.3	8.0	6.9	8.1	7.4	7.1	8.6	8.2	7.4	6.8	8.1	8.2	7.8	6.9	5.6	5.9
7.2	5.8	5.9	6.1	5.1	4.6	3.0	6.7	8.4	6.2	5.5	6.2	6.3	7.3	7.3	5.9	5.0	4.1	5.6	6.6	6.0	3.5	2.2	3.7	3.5	4.3	6.3	8.0	9.5	7.7	6.8	5.7	5.9	5.3	5.2	6.2
6.1	5.8	5.9	6.5	6.9	7.0	7.9	10.2	10.6	9.0	8.7	8.8	6.5	5.8	4.8	4.0	6.1	8.7	9.0	6.9	5.9	5.4	3.1	4.4	8.7	10.5	10.6	12.3	10.6	7.9	7.1	9.5	7.4	7.1	7.9	6.4
9.7	9.1	8.5	9.6	9.7	8.8	8.8	11.5	10.0	9.4	12.8	12.9	11.2	8.0	8.2	9.3	11.9	10.1	11.7	11.3	11.7	8.8	4.0	4.0	7.4	9.1	11.0	11.1	10.6	11.2	11.2	11.9	12.6	13.0	11.5	8.8
9.7	8.4	7.8	5.2	3.4	2.0	1.8	2.6	2.9	2.6	8.4	10.8	10.7	6.7	6.5	3.7	2.4	3.0	4.6	6.5	7.0	4.1	2.4	4.4	7.7	8.8	10.4	10.8	11.7	9.5	7.9	11.6	12.1	13.2	11.5	8.1
9.1	8.8	8.1	5.6	3.7	3.8	3.3	2.1	1.8	2.0	4.6	7.2	7.0	5.7	4.9	2.9	1.4	1.6	1.6	2.4	2.9	2.3	2.4	3.5	7.3	7.9	7.1	5.8	4.3	3.5	7.8	6.7	5.6	6.2	6.4	6.0
9.0	11.8	9.9	6.8	5.4	4.6	5.5	6.1	4.2	2.6	2.7	5.4	9.6	8.3	7.3	6.3	5.7	3.4	2.5	2.6	2.6	2.5	4.6	4.9	3.8	3.8	3.6	3.3	3.1	4.9	5.4	6.2	5.3	6.0	8.3	7.3
7.9	9.0	10.5	9.3	7.0	6.4	8.0	9.5	8.5	5.6	5.7	6.8	6.5	8.0	8.0	7.8	8.7	7.4	6.3	5.9	5.3	6.2	7.2	6.8	5.6	5.5	5.4	6.5	6.6	6.8	6.9	6.3	5.7	5.7	8.8	9.2
6.0	6.7	6.3	6.5	6.2	6.0	5.9	6.9	8.1	7.1	6.6	6.2	4.9	5.2	5.9	5.3	6.8	7.4	7.9	7.3	7.3	7.5	7.0	7.0	6.3	6.4	6.5	6.5	6.6	7.4	7.5	6.5	6.6	7.4	7.3	7.0
4.9	4.9	5.5	4.9	5.6	6.4	6.0	6.0	6.7	6.9	7.3	7.2	5.8	5.8	5.7	5.7	5.6	5.7	7.0	7.4	6.6	6.7	6.4	6.0	6.1	6.1	6.3	5.9	5.8	5.5	5.5	5.8	6.0	5.2	5.6	5.9
4.9	4.4	4.8	4.9	5.1	5.4	5.6	5.5	6.4	6.1	6.5	7.4	7.3	6.7	4.8	5.1	4.6	4.4	4.7	5.1	5.4	5.7	5.6	5.7	5.8	4.9	4.4	5.0	4.9	4.8	4.7	5.2	5.5	5.6	5.3	4.8
2.9	2.9	3.5	4.0	4.1	5.5	5.8	6.6	8.0	7.5	7.9	8.3	8.1	6.4	5.4	5.6	6.6	4.9	3.9	3.9	4.0	4.0	3.4	2.8	3.5	3.3	2.6	2.3	2.6	2.4	2.2	2.1	2.5	3.3	4.8	3.5
5.5	6.0	7.0	7.5	8.0	7.8	7.9	7.9	7.4	6.0	5.2	4.6	4.8	5.0	5.1	4.5	3.7	3.3	3.3	3.2	2.9	2.8	2.6	4.0	4.4	3.4	3.2	3.2	2.8	2.7	3.1	3.8	4.7	6.1	6.2	5.8

Figure 47. ATOVS MEAN O-B brightness temperature differences (deg C). MAY 2004
Channel: HIRS4 (400 hPa)
NOAA16, using all observations



-.5	-.5	-.5	-.5	-.5	-.5	-.5	-.5	-.5	-.5	-.5	-.5	-.5	-.5	-.4	-.4	-.4	-.4	-.4	-.4	-.4	-.4	-.4	-.4	-.4	-.3	-.3	-.3	-.3	-.3	-.4	-.4	-.5	-.5	-.5	-.5
-.8	-.8	-.8	-.7	-.7	-.6	-.5	-.5	-.5	-.6	-.7	-.7	-.7	-.6	-.6	-.6	-.7	-.7	-.7	-.7	-.7	-.7	-.7	-.7	-.7	-.7	-.6	-.6	-.6	-.6	-.6	-.6	-.7	-.7	-.7	-.7
-1.1	-1.4	-1.6	-1.5	-1.3	-1.0	-.8	-.7	-.7	-.7	-.8	-.9	-.9	-1.1	-1.1	-1.2	-1.3	-1.3	-1.2	-1.2	-1.0	-1.1	-1.1	-1.3	-1.5	-1.4	-1.2	-1.0	-.8	-.8	-.9	-1.0	-1.1	-1.1	-1.0	-1.0
-1.4	-1.9	-2.0	-2.0	-2.8	-1.8	-1.6	-1.4	-1.3	-1.4	-1.4	-1.6	-1.6	-1.5	-1.8	-2.0	-1.9	-1.9	-1.8	-1.6	-1.4	-1.5	-1.7	-2.0	-2.0	-2.0	-1.9	-1.9	-1.8	-1.4	-1.5	-1.7	-1.7	-1.5	-1.5	-1.4
-2.2	-2.2	-2.5	-2.4	-2.1	-2.1	-2.5	-2.5	-3.1	-3.3	-2.9	-2.6	-2.4	-2.4	-2.4	-2.2	-2.1	-2.1	-2.2	-1.9	-2.0	-2.1	-2.3	-2.4	-2.6	-2.4	-2.5	-2.5	-2.6	-2.2	-2.1	-2.4	-2.7	-2.7	-2.4	-2.4
-3.1	-3.2	-2.8	-2.7	-2.6	-2.3	-2.8	-3.2	-3.5	-3.6	-3.1	-3.0	-3.1	-2.6	-2.4	-2.2	-2.1	-2.3	-2.2	-2.5	-2.5	-2.4	-2.6	-2.9	-3.0	-2.9	-3.0	-3.4	-3.3	-3.0	-3.3	-3.6	-3.7	-3.6	-3.0	-3.1
-3.5	-3.2	-2.9	-3.0	-3.0	-2.8	-2.9	-3.4	-3.4	-3.4	-3.1	-3.1	-3.2	-3.0	-3.1	-2.9	-2.9	-3.0	-2.9	-3.3	-3.1	-2.8	-2.9	-2.9	-3.0	-2.9	-2.9	-3.5	-3.7	-3.4	-3.5	-2.9	-3.3	-3.1	-3.1	-3.4
-3.3	-3.4	-3.5	-3.4	-3.8	-3.4	-3.8	-4.8	-4.8	-4.5	-4.2	-4.3	-3.8	-3.5	-3.5	-3.1	-3.5	-4.4	-4.1	-3.6	-3.2	-3.1	-3.3	-3.2	-3.7	-4.3	-3.8	-5.6	-5.5	-3.5	-3.6	-4.3	-3.7	-3.7	-3.8	-3.4
-4.3	-3.9	-3.7	-3.9	-4.0	-3.7	-3.9	-4.8	-4.4	-4.2	-6.2	-6.4	-5.3	-3.7	-3.9	-4.2	-5.1	-5.9	-5.9	-5.1	-5.2	-4.0	-3.4	-3.2	-3.4	-3.9	-4.9	-6.0	-5.4	-5.5	-4.8	-5.1	-5.3	-5.3	-5.1	-4.0
-4.1	-3.6	-3.6	-3.3	-3.0	-2.9	-2.8	-3.1	-3.3	-3.1	-4.0	-5.1	-5.0	-3.7	-3.3	-3.1	-3.0	-3.3	-3.7	-3.6	-3.9	-3.2	-3.2	-3.4	-3.6	-3.8	-4.6	-5.1	-5.6	-4.6	-3.8	-5.0	-5.4	-5.5	-5.0	-3.7
-3.9	-3.7	-3.6	-3.3	-2.9	-3.1	-2.8	-2.8	-3.2	-3.0	-3.2	-3.7	-3.8	-3.6	-3.1	-2.9	-2.8	-2.7	-2.8	-2.6	-2.8	-2.9	-2.9	-3.1	-3.5	-3.5	-3.8	-3.6	-3.3	-3.1	-3.5	-3.5	-3.4	-3.5	-3.5	-3.0
-3.7	-4.8	-4.3	-3.5	-3.0	-2.9	-2.7	-2.9	-3.0	-2.7	-2.5	-2.8	-3.5	-3.7	-3.2	-3.0	-3.0	-2.5	-2.6	-2.4	-2.6	-2.6	-3.6	-2.9	-2.6	-2.5	-2.9	-2.7	-2.5	-2.6	-2.7	-3.0	-2.7	-3.0	-3.6	-3.2
-2.7	-3.4	-4.1	-3.8	-3.0	-2.6	-2.8	-3.4	-3.6	-2.8	-2.5	-2.8	-2.4	-2.8	-2.8	-2.9	-3.3	-3.1	-3.0	-2.7	-2.7	-2.7	-2.8	-2.6	-2.2	-2.2	-2.4	-2.5	-2.3	-2.4	-2.5	-2.4	-2.3	-2.3	-3.0	-3.4
-2.1	-2.5	-2.6	-2.5	-2.4	-2.2	-2.1	-2.4	-3.2	-3.2	-2.9	-2.6	-2.2	-2.0	-2.1	-2.0	-2.3	-2.7	-2.9	-2.8	-2.7	-2.6	-2.4	-2.4	-2.1	-2.0	-2.2	-2.3	-2.3	-2.4	-2.6	-2.4	-2.3	-2.4	-2.5	-2.5
-1.8	-1.7	-1.9	-1.9	-1.9	-2.0	-2.0	-2.2	-2.6	-2.7	-2.7	-2.5	-2.1	-2.0	-2.0	-1.9	-1.8	-1.8	-2.2	-2.3	-2.1	-2.1	-1.9	-1.9	-1.8	-1.8	-1.8	-1.9	-1.9	-1.9	-2.0	-2.1	-2.1	-2.0	-2.0	-2.0
-1.7	-1.5	-1.6	-1.7	-1.7	-1.8	-1.9	-2.0	-2.4	-2.5	-2.5	-2.8	-2.6	-2.4	-2.0	-1.9	-1.9	-1.9	-2.0	-2.0	-2.0	-2.0	-1.8	-1.8	-1.8	-1.6	-1.6	-1.6	-1.6	-1.7	-1.7	-1.7	-1.7	-1.7	-1.7	-1.7
-1.6	-1.6	-1.6	-1.6	-1.7	-1.9	-2.2	-2.3	-2.6	-2.7	-3.1	-3.3	-3.2	-2.9	-2.5	-2.5	-2.5	-2.2	-1.9	-1.7	-1.5	-1.5	-1.4	-1.4	-1.7	-1.7	-1.4	-1.1	-.8	-.8	-.9	-.9	-1.0	-1.3	-1.4	-1.5
-2.1	-2.2	-2.4	-2.6	-2.7	-2.6	-2.7	-2.8	-2.8	-2.6	-2.6	-2.6	-2.6	-2.8	-2.9	-2.7	-2.4	-2.4	-2.4	-2.2	-1.8	-1.7	-1.9	-2.3	-2.5	-1.6	-.9	-1.1	-1.4	-1.4	-1.5	-1.6	-1.8	-1.9	-1.9	-2.1

Figure 48. ATOVS SD O-B brightness temperature differences (deg C). MAY 2004
Channel: HIRS4 (400 hPa)
NOAA16, using all observations



.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.5	.5	.5	.5	.5	.5	.6	.6	.6	.6	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5
.7	.7	.7	.7	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.7	.7	.7	.7	.7	.7	.7	.6	.6	.6	.6	.6	.6	.8	.6	.6	.6	.6
1.0	1.2	1.2	1.1	1.1	.9	.8	.7	.6	.7	.7	.8	.8	1.0	.9	1.0	1.0	1.0	1.0	1.0	.9	.9	.9	1.0	1.1	1.1	1.0	.9	.8	.8	.8	.9	.9	.8	.8	.9
1.2	1.6	1.5	1.5	1.3	1.3	1.2	1.2	1.2	1.3	1.3	1.4	1.4	1.2	1.5	1.4	1.1	1.1	1.2	1.1	1.1	1.1	1.1	1.4	1.5	1.4	1.3	1.4	1.4	1.1	1.2	1.4	1.3	1.1	1.0	1.1
1.5	1.4	1.8	1.8	1.3	1.3	1.6	1.8	2.7	2.5	2.1	1.7	1.6	1.5	1.4	1.2	1.1	1.2	1.4	1.2	1.4	1.4	1.4	1.8	1.9	1.7	1.7	1.7	1.8	1.7	1.8	1.8	2.0	1.9	1.7	1.8
2.2	2.4	2.1	1.9	1.7	1.4	1.7	2.3	2.8	2.2	2.0	2.0	2.0	1.6	1.5	1.4	1.2	1.3	1.4	1.8	1.9	1.6	1.4	2.1	1.7	1.6	2.0	2.1	2.3	2.0	2.7	2.8	2.9	2.4	2.1	2.1
2.5	2.2	2.1	2.1	1.9	1.9	1.5	2.1	2.6	2.2	2.1	2.5	2.1	2.5	2.4	2.0	1.9	1.6	1.9	2.0	2.1	1.5	1.3	1.7	1.6	1.9	2.3	2.8	3.1	2.6	2.8	2.5	2.2	2.0	2.0	2.1
2.5	2.3	2.4	2.5	2.8	3.0	2.8	3.6	3.7	3.1	3.2	3.4	2.6	2.7	2.2	2.2	2.7	3.3	3.2	2.6	2.0	2.0	1.5	1.9	3.1	4.1	3.8	4.1	4.3	3.2	2.9	3.8	2.7	3.0	3.3	2.6
3.7	3.3	3.1	3.4	3.6	3.3	3.3	4.1	3.6	3.3	4.7	4.9	4.0	3.1	3.2	3.4	4.5	3.8	4.2	4.1	4.4	3.2	1.9	2.1	3.0	3.5	4.2	4.3	4.4	4.1	3.9	4.4	4.5	4.5	4.1	3.0
3.2	2.9	2.7	2.1	1.9	1.6	1.7	2.0	1.8	1.7	3.0	4.0	4.0	2.8	2.8	2.1	1.8	2.0	2.3	2.9	2.7	1.9	1.7	2.0	2.9	3.4	4.0	4.2	4.4	3.3	2.8	4.3	4.5	4.6	4.0	2.9
2.9	3.0	2.8	2.4	1.9	1.7	1.8	1.6	1.3	1.7	2.0	2.6	2.7	2.5	2.3	1.9	1.5	1.6	1.5	1.6	1.6	1.4	1.5	1.5	2.8	3.3	2.7	2.5	2.1	2.0	2.5	2.4	2.7	2.6	2.2	2.2
2.8	3.9	3.4	2.3	1.9	1.5	1.8	2.0	1.6	1.6	1.4	1.9	3.1	2.6	2.3	1.8	2.0	1.7	1.4	1.5	1.4	1.2	1.6	1.7	1.6	1.6	1.5	1.6	1.5	1.8	1.8	1.7	1.9	2.0	2.9	2.8
2.0	2.6	3.1	2.8	2.2	1.6	2.0	2.6	2.3	1.6	1.5	1.9	1.7	2.2	2.2	2.3	2.6	2.1	1.8	1.8	1.7	1.7	1.9	1.6	1.4	1.2	1.2	1.4	1.6	1.7	1.8	1.7	1.8	1.7	2.6	3.1
1.6	1.8	1.8	1.9	1.8	1.6	1.5	1.6	2.2	2.0	1.9	2.1	1.9	1.6	1.6	1.4	1.7	2.1	2.0	2.0	1.9	1.9	1.8	1.6	1.6	1.6	1.5	1.6	1.5	1.6	1.7	1.5	1.5	1.6	1.6	1.8
1.1	1.1	1.2	1.3	1.4	1.4	1.4	1.5	1.7	1.9	2.1	2.3	1.9	1.8	1.8	1.7	1.4	1.5	1.5	1.8	1.5	1.6	1.5	1.5	1.4	1.4	1.4	1.4	1.4	1.4	1.5	1.5	1.5	1.4	1.3	1.1
1.4	1.2	1.2	1.3	1.2	1.2	1.4	1.4	1.6	1.6	1.8	2.4	2.3	2.3	1.7	1.6	1.3	1.2	1.2	1.3	1.3	1.3	1.2	1.3	1.2	1.1	1.0	1.1	1.2	1.3	1.4	1.4	1.4	1.4	1.4	1.3
1.0	1.1	1.1	1.2	1.3	1.5	1.6	1.6	2.0	2.2	2.3	2.6	2.5	2.0	1.7	1.6	1.6	1.3	.9	.9	1.0	1.0	.9	.9	1.0	.9	.8	.8	.7	.9	.9	.9	1.0	1.0	1.1	1.0
1.5	1.7	2.0	2.2	2.3	2.4	2.5	2.6	2.4	2.1	1.9	1.6	1.6	1.8	1.8	1.6	1.5	1.3	1.2	1.3	1.2	1.1	1.0	1.0	1.0	1.4	1.1	1.3	1.4	1.4	1.4	1.5	1.6	1.7	1.6	1.5

Figure 49. ATOVS MEAN O-B brightness temperature differences (deg C). MAY 2004
Channel: AMSUA-5 (700 hPa)
NOAA16, using all observations

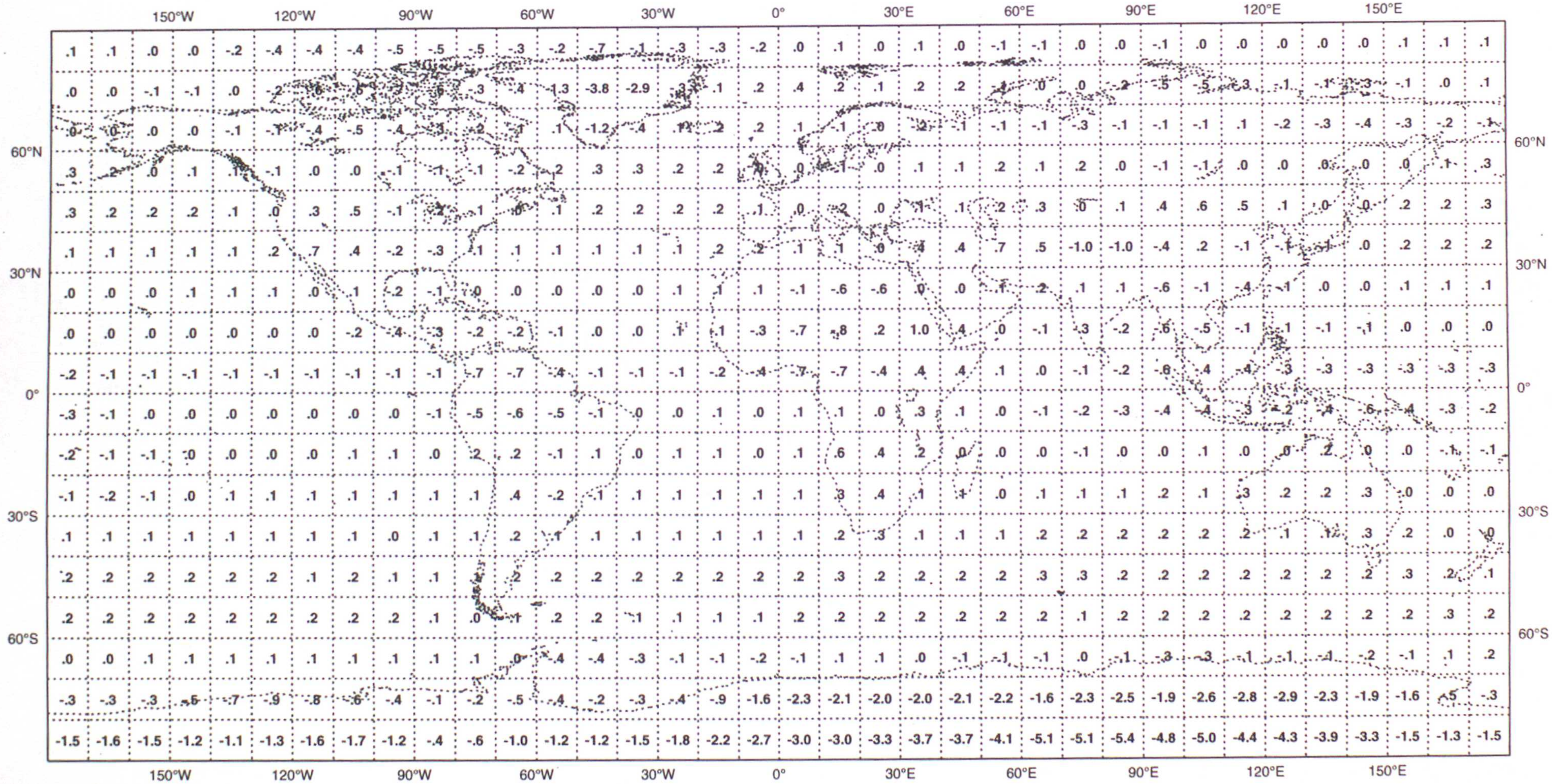

150°W
120°W
90°W
60°W
30°W
0°
30°E
60°E
90°E
120°E
150°E
60°N
30°N
0°
30°S
60°S

Figure 50. ATOVS SD O-B brightness temperature differences (deg C). MAY 2004
Channel: AMSUA-5 (700 hPa)
NOAA16, using all observations

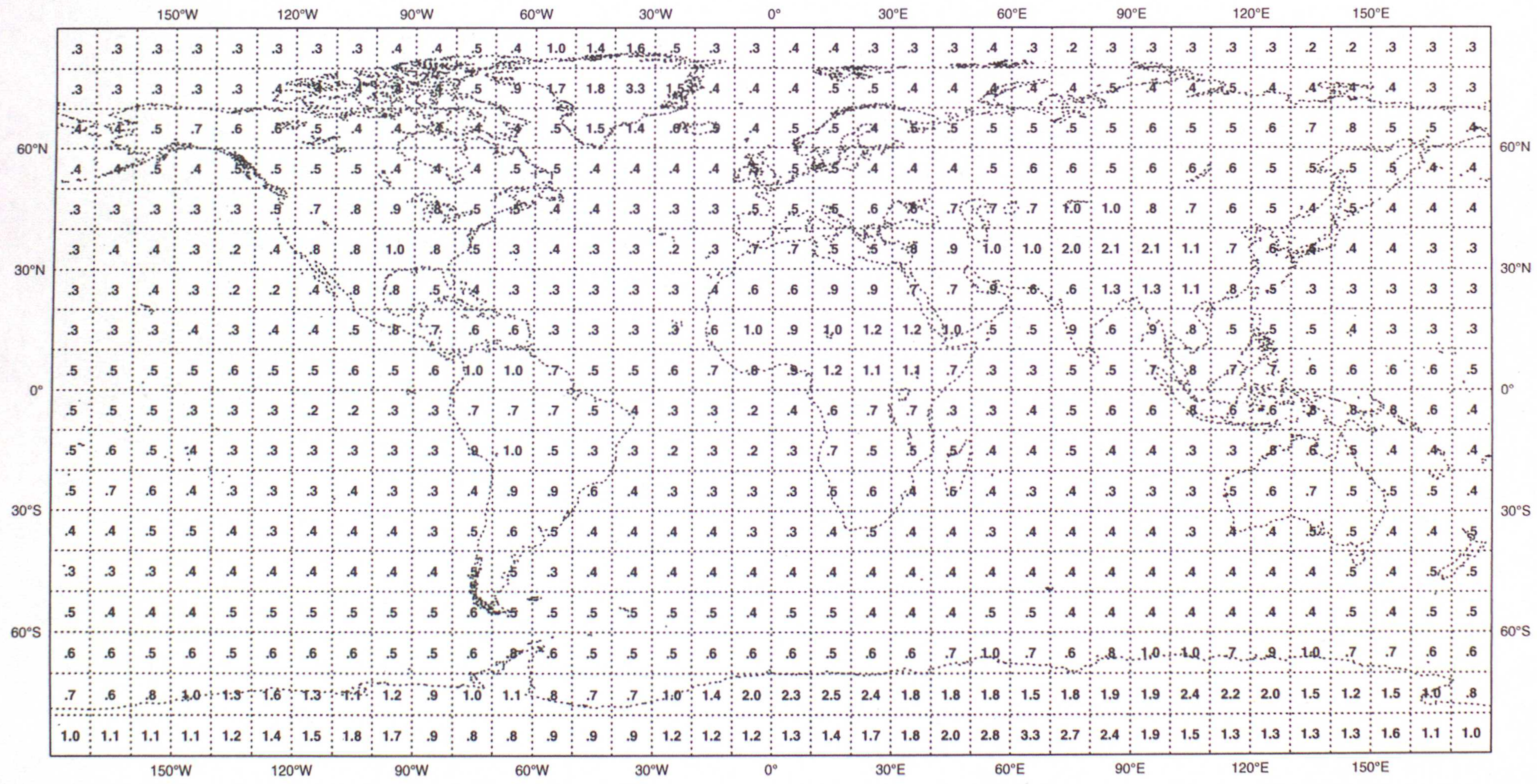

150°W
120°W
90°W
60°W
30°W
0°
30°E
60°E
90°E
120°E
150°E
60°N
30°N
0°
30°S
60°S

Figure 51. ATOVS MEAN O-B brightness temperature differences (deg C). MAY 2004
Channel: AMSUA-7 (300 hPa)
NOAA16, using all observations

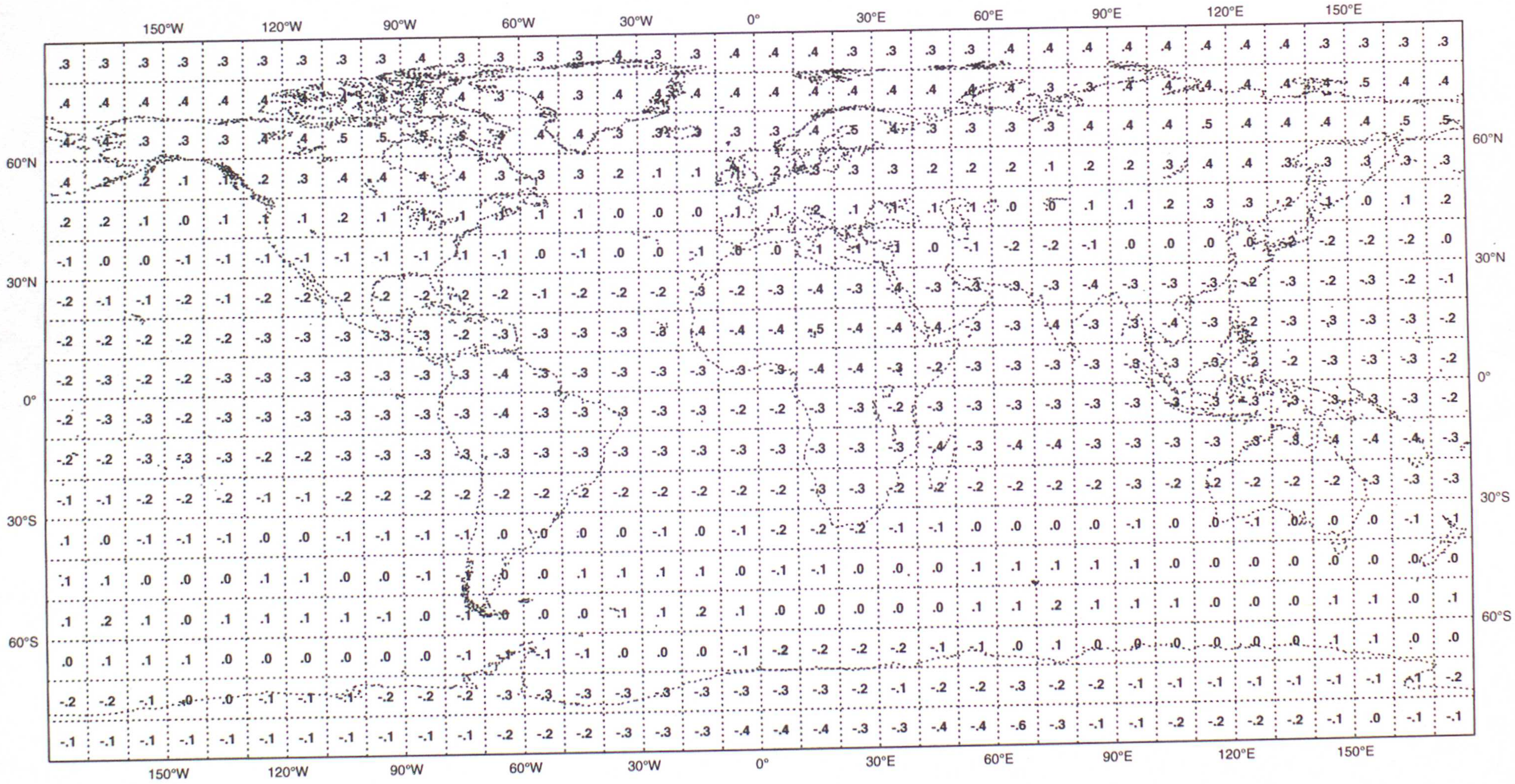

150°W
120°W
90°W
60°W
30°W
0°
30°E
60°E
90°E
120°E
150°E
60°N
30°N
0°
30°S
60°S

Figure 52. ATOVS SD O-B brightness temperature differences (deg C). MAY 2004
Channel: AMSUA-7 (300 hPa)
NOAA16, using all observations

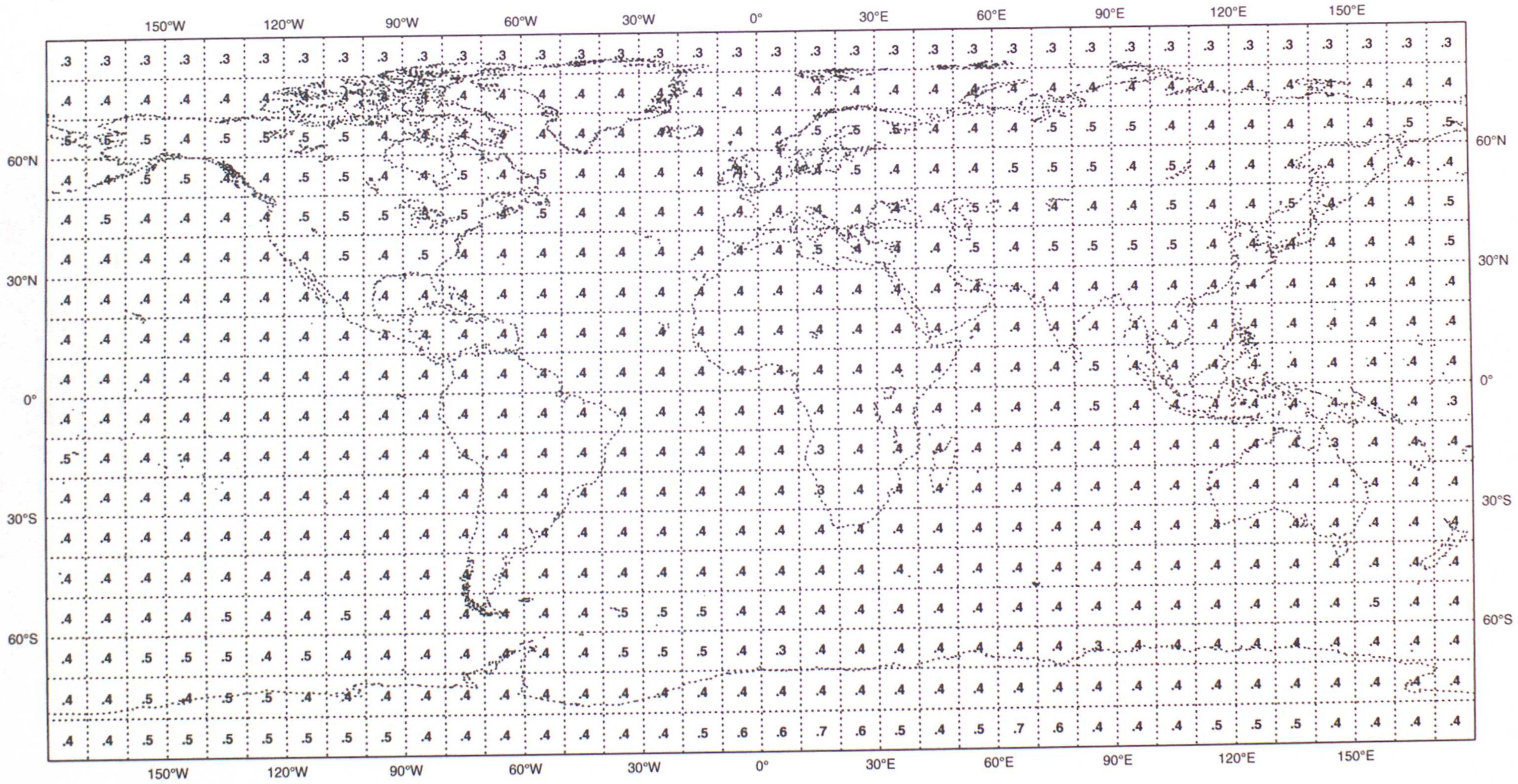

150°W
120°W
90°W
60°W
30°W
0°
30°E
60°E
90°E
120°E
150°E
60°N
30°N
0°
30°S
60°S

Figure 53. ATOVS MEAN O-B brightness temperature differences (deg C). MAY 2004
Channel: AMSUA-9 (100 hPa)
NOAA16, using all observations

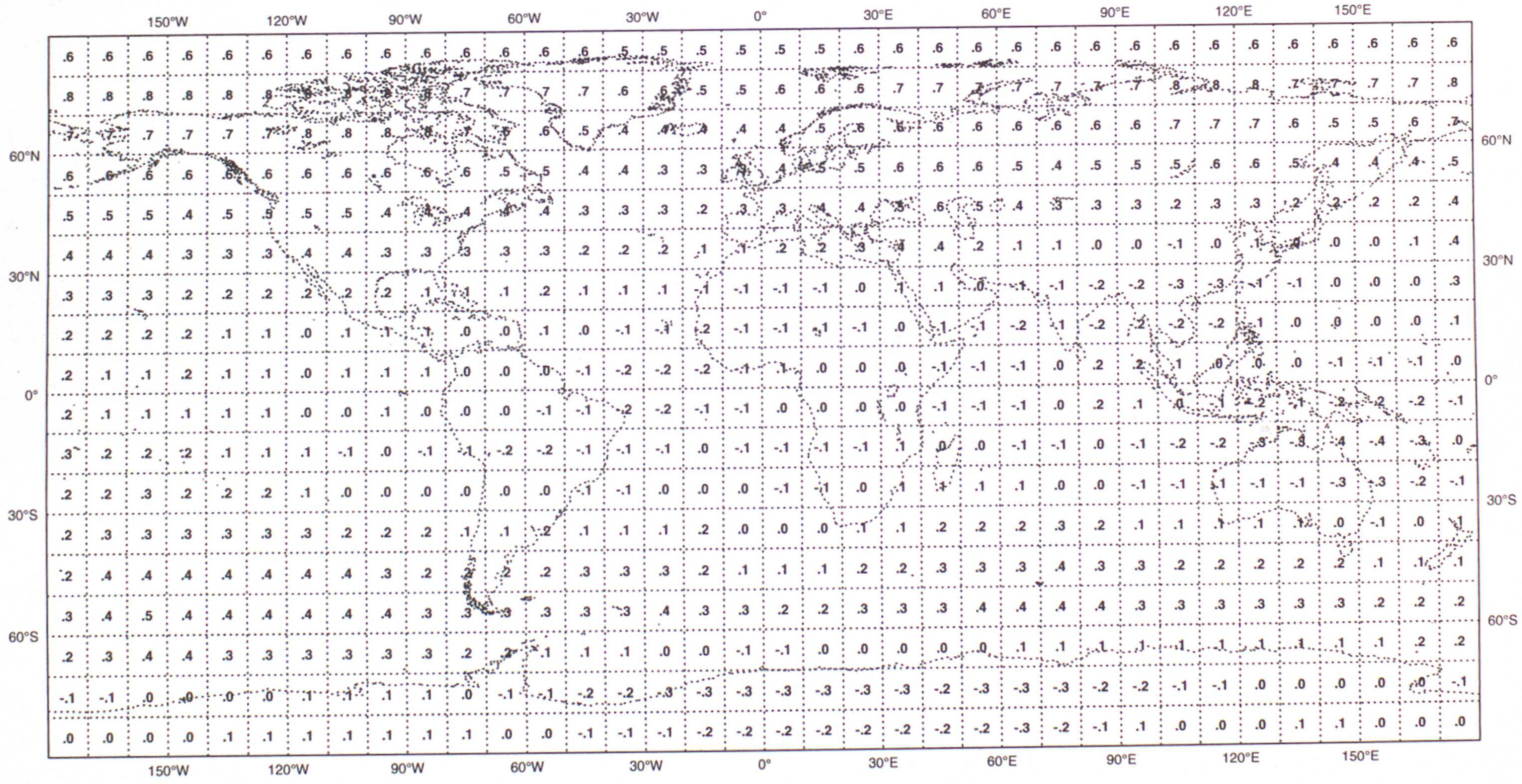

150°W
120°W
90°W
60°W
30°W
0°
30°E
60°E
90°E
120°E
150°E
60°N
30°N
0°
30°S
60°S

Figure 54. ATOVS SD O-B brightness temperature differences (deg C). MAY 2004
Channel: AMSUA-9 (100 hPa)
NOAA16, using all observations

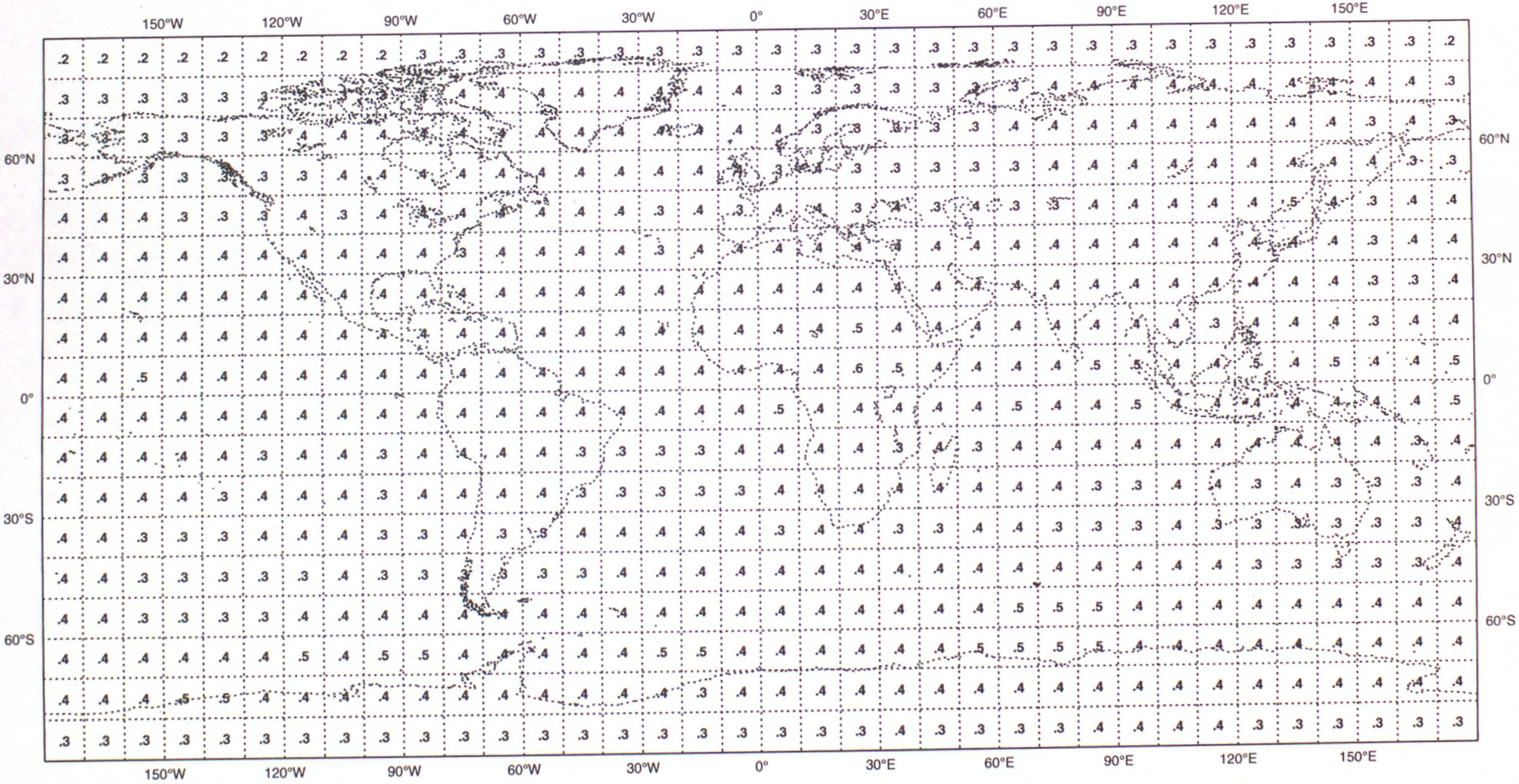

150°W
120°W
90°W
60°W
30°W
0°
30°E
60°E
90°E
120°E
150°E
60°N
30°N
0°
30°S
60°S

TABLE 8

MONTHLY MONITORING OF MARINE SURFACE OBSERVATIONS (COSNA)
DATA TYPE:- DRIFTER
MONITORING CENTRE: EXETER
MONTH: May 2004

Monitoring procedures

Period :One calendar month.

Data monitored :Reports from each unique identifier for drifting buoy.

Area monitored :10°N - 80°N, 85°W - 0°W

Standard of comparison :Background field from UKMO global model.

Position :Average latitude and longitude for period.

Observation times :All hours combined.

Elements monitored
:Mean sea-level pressure (hPa)
:Wind speed ($m\ s^{-1}$)
:Wind direction (degrees)

Parameters monitored

:NOBS :Number of observations received excluding duplicates.

:NGE :Number of observations with gross errors.

:PGE :Percentage of observations with gross errors.

:SD :SD of difference of observations from background values excluding those with gross errors.

:BIAS :Mean difference of observations from background values excluding those with gross errors.
N.B. A positive bias indicates the wind observation is veered to the background

:RMS :Root Mean Square difference of observations from background values excluding those with gross errors

GROSS ERROR LIMITS
:15 hPa (pressure)
:25 $m\ s^{-1}$ (Vector Wind)

N.B. Observations of wind direction are only included in the wind direction statistics if the observed OR background wind speed > 5 $m\ s^{-1}$

IDENTIFIER	LAT.	LONG.	ELEM	NOBS	PGE	%REJ	SD	BIAS	RMS
13531	19.5	-27.9	P	1039	0	35	0.5	0.3	0.6
13532	30.3	-13.3	P	291	0	2	0.7	1.1	1.3
13533	17.0	-45.2	P	1246	0	44	0.5	0.4	0.6
13600	19.9	-39.8	P	496	0	8	0.5	1.1	1.2
13602	20.8	-40.9	P	412	0	0	0.5	0.3	0.6
41520	15.7	-54.3	P	975	0	69	1.0	1.2	1.6
41590	25.9	-61.5	P	513	0	0	0.4	1.2	1.3
41594	23.1	-43.8	P	554	0	0	0.4	-0.1	0.4
41595	24.6	-36.9	P	526	0	0	0.5	0.9	1.0
41600	41.9	-57.4	P	626	0	1	0.7	-0.5	0.9
41601	39.9	-51.7	P	713	0	14	0.7	0.0	0.7
41631	28.7	-71.2	P	431	0	0	0.6	0.4	0.8
41646	26.1	-73.3	P	441	0	0	0.6	0.6	0.9
41655	23.9	-61.8	P	398	0	0	0.4	0.8	0.9
41666	29.3	-52.6	P	117	0	0	0.4	1.0	1.0
44546	51.3	-18.3	P	608	0	2	0.6	-0.1	0.6
44547	56.9	-38.4	P	654	1	3	1.0	-0.4	1.1
44551	55.0	-17.2	P	671	0	2	0.9	0.7	1.2
44603	60.6	-14.8	P	729	0	4	0.8	0.1	0.8
44605	56.0	-6.9	P	250	0	5	0.4	-0.1	0.4
44606	28.9	-60.4	P	693	0	2	0.5	-0.5	0.7
44609	59.5	-12.2	P	663	0	4	1.2	-0.5	1.3
44612	54.8	-19.1	P	614	0	1	0.6	-0.2	0.6
44613	63.1	-9.1	P	1066	0	37	0.6	-0.7	0.9
44614	63.2	-35.5	P	683	0	4	0.9	-0.9	1.2
44617	47.8	-43.6	P	591	0	2	0.8	0.2	0.8
44623	29.1	-45.9	P	697	0	2	0.5	-0.1	0.5
44624	49.2	-44.0	P	597	0	6	1.5	0.6	1.6
44625	58.3	-38.3	P	571	0	2	0.9	0.6	1.0
44626	42.0	-56.6	P	636	0	2	0.8	0.4	0.9
44627	49.7	-39.5	P	620	0	1	0.9	-0.1	0.9
44628	34.9	-29.5	P	690	0	3	0.5	-0.7	0.9
44630	28.4	-32.8	P	695	0	2	0.5	0.3	0.6
44742	49.2	-31.1	P	590	0	2	0.8	0.6	1.0
44743	49.7	-28.1	P	582	0	1	0.6	-0.2	0.6
44744	47.9	-28.7	P	731	0	5	1.4	-0.2	1.4
44745	50.0	-29.7	P	732	0	3	0.7	0.1	0.7
44747	47.3	-23.6	P	560	0	1	0.5	0.3	0.6
44761	52.9	-38.8	P	696	0	16	1.0	0.3	1.1
44762	54.1	-37.8	P	466	0	4	1.2	0.6	1.3
44765	40.6	-48.4	P	572	0	1	0.7	-0.5	0.9
44766	48.6	-26.1	P	590	0	1	0.6	0.1	0.6
44771	47.9	-14.4	P	221	0	24	0.5	-0.4	0.7
44773	63.1	-29.2	P	274	0	20	0.8	0.1	0.8
44777	25.3	-27.4	P	244	0	15	0.4	-0.1	0.5
44778	34.6	-20.9	P	243	0	15	0.4	0.0	0.4
44780	61.9	-17.4	P	659	0	41	0.5	-0.3	0.6
62514	31.6	-26.9	P	719	0	2	0.5	0.2	0.6
62515	21.0	-72.8	P	221	0	3	0.5	0.4	0.6
62517	27.8	-37.9	P	723	0	2	0.5	-0.6	0.8
62551	36.1	-21.3	P	729	0	3	0.5	-0.2	0.5
62552	33.6	-21.5	P	297	0	17	0.5	0.7	0.8
62556	42.6	-14.4	P	719	0	2	0.4	0.0	0.4
62557	42.8	-12.1	P	730	0	2	0.5	0.0	0.5
62558	44.2	-18.2	P	718	0	2	0.5	0.0	0.5
62559	46.6	-15.1	P	721	0	3	0.5	-0.3	0.6
62576	45.3	-8.2	P	676	0	2	0.5	0.1	0.5
62694	51.3	-18.7	P	604	0	1	0.6	0.2	0.6
62712	62.1	-9.4	P	660	0	3	0.4	0.1	0.5
62801	34.8	-19.2	P	636	0	3	0.4	0.3	0.5

IDENTIFIER	LAT.	LONG.	ELEM	NOBS	PGE	%REJ	SD	BIAS	RMS
64608	62.3	-30.3	P	663	0	2	0.7	-0.5	0.8
65597	51.4	-44.0	P	409	0	28	0.8	-0.6	1.0
65598	57.6	-30.1	P	325	0	25	0.9	-0.6	1.1
65599	57.6	-31.3	P	208	0	19	0.8	-0.5	1.0
65600	59.8	-40.2	P	39	0	10	0.8	-0.8	1.1

IDENTIFIER	LAT.	LONG.	ELEM	NOBS	PGE	%REJ	SD	BIAS	RMS
13600	19.9	-39.8	SPEED	479	0	100	1.2	-1.0	1.5
13602	20.8	-40.9	SPEED	410	0	100	1.3	-0.6	1.4
41590	25.9	-61.5	SPEED	504	0	100	1.2	-1.5	2.0
41594	23.1	-43.8	SPEED	533	0	100	1.0	-0.5	1.2
41595	24.6	-36.9	SPEED	504	0	100	0.9	-0.9	1.3
44546	51.3	-18.3	SPEED	599	0	100	1.7	0.2	1.7
44551	55.0	-17.2	SPEED	559	0	100	2.0	0.1	2.0

IDENTIFIER	LAT.	LONG.	ELEM	NOBS	PGE	%REJ	SD	BIAS	RMS
13600	19.9	-39.8	DIRN.	245	0	0	34.3	15.9	37.8
13602	20.8	-40.9	DIRN.	207	0	0	14.6	-20.6	25.3
41590	25.9	-61.5	DIRN.	281	0	0	19.4	-5.3	20.1
41594	23.1	-43.8	DIRN.	269	0	0	12.7	-3.7	13.3
41595	24.6	-36.9	DIRN.	155	0	0	14.3	-22.1	26.3
44546	51.3	-18.3	DIRN.	436	0	0	16.7	7.2	18.2
44551	55.0	-17.2	DIRN.	427	0	0	19.5	4.3	19.9

TABLE 9

MONTHLY MONITORING OF AIRCRAFT OBSERVATIONS (COSNA)
MONITORING CENTRE: EXETER
MONTH: May 2004

Monitoring procedures:

Period :One calendar month.

Data monitored :Statistics for each airline carrier.

Area monitored :40°N - 70°N, 60°W - 0°W.

Standard of comparison :Background field from UKMO global model.

Observation times :All hours combined.

Level(s) monitored :300.0 - 150.0 hPa

Elements monitored :TEMP in °C ; WIND in m s^{-1}

Parameters monitored :N REP. :Number of observations received excluding duplicates.

:PG :Percentage of observations with gross errors.

:PR :Percentage of observations rejected by quality control including rejections from the duplicate check.

:PC :Percentage of observations with calm winds.

:RMS :Root Mean Square difference of observations from background values excluding those with gross errors in Temperature & vector wind.

:BIAS :Mean difference of observations from background values excluding those with gross errors in Temperature & vector wind.

GROSS ERROR LIMITS :10.0 °C ; 60 m s^{-1} Vector Wind

SELECTION CRITERIA :N REP $\geq$ 20

NB: All American ACARS data are grouped together and statistics are shown at the bottom of the table as "US ACARS". All ADS reports are similarly grouped together.

		TEMPERATURE				WIND					
IDENT.	N.REP.	PG	PR	RMS	BIAS	N.REP.	PG	PR	PC	RMS	BIAS
AAL	789	1	10	1.7	0.2	529	0	8	0	7.9	0.5
ACA	943	0	4	1.8	-0.2	580	0	3	0	6.6	0.7
AEA	270	1	4	1.2	0.3	210	0	4	0	7.9	-0.4
AEL	154	1	13	1.9	-0.3	129	0	13	0	7.4	1.1
AEW	80	1	6	1.5	-0.4	31	0	3	0	7.9	0.3
AFL	406	1	3	1.8	0.2	208	0	3	0	7.2	1.3
AFR	666	0	5	1.4	0.1	615	0	7	0	7.5	0.3
AJM	261	0	4	1.4	-0.4	194	1	3	0	6.1	0.8
AMT	85	0	11	1.6	0.4	86	0	10	0	7.5	0.1
AMX	239	2	5	1.7	0.2	178	0	100	0	10.1	0.0
AVA	30	0	0	1.5	0.2	28	0	0	0	5.5	1.1
AZA	375	1	7	2.2	0.3	299	0	4	0	7.1	-0.1
BAF	47	0	2	1.9	-0.9	35	0	0	0	5.9	2.1
BAL	226	0	14	1.5	0.1	226	0	15	0	6.3	-0.1
BAW	480	0	15	2.1	-0.8	334	0	12	0	6.2	0.2
BPA	218	1	13	1.9	-0.6	216	0	14	0	6.4	0.3
BWA	116	0	3	1.5	-0.3	94	1	7	0	9.3	0.5
CFC	26	0	4	1.2	-0.2	25	0	4	0	7.6	0.4
CFG	418	0	6	1.5	-0.2	346	0	7	0	7.1	-0.3
CKS	184	1	9	2.1	0.5	124	1	8	0	12.1	0.3
CLX	251	0	2	1.5	-0.6	165	0	2	0	6.2	0.5
COA	168	1	38	1.4	0.0	119	1	42	0	7.6	0.9
CRL	254	0	3	1.2	0.7	215	0	5	0	7.7	0.2
CTM	22	0	14	1.0	-0.4	21	0	14	0	5.0	0.8
CUB	122	1	2	1.3	-0.4	102	1	6	0	8.6	0.4
DAL	1525	0	6	1.5	-0.6	1032	0	6	0	7.5	0.3
DCE	27	0	19	2.5	1.3	24	0	21	0	13.1	-3.4
DHL	141	1	100	6.1	-5.9	81	0	100	0	11.7	2.5
DLH	608	1	14	1.5	0.0	593	0	13	0	7.9	0.6
EDW	51	0	4	1.5	-0.4	38	0	8	0	8.2	1.0
EEZ	35	0	14	1.8	-0.2	36	0	17	0	8.4	0.9
EIA	296	2	100	3.1	0.9	246	0	100	0	22.0	8.3
ELY	104	1	2	1.4	-0.3	85	0	2	0	8.2	-0.6
ETH	34	0	26	2.4	0.4	35	0	20	0	6.9	1.1
FCA	133	0	1	1.3	0.1	109	1	5	0	7.5	0.0
FDX	572	0	28	1.5	0.2	432	0	25	0	7.0	0.5
FIN	175	1	5	1.8	0.2	128	0	2	0	6.3	0.4
FWI	273	0	3	1.5	-0.3	257	0	6	0	8.3	-0.1
GAF	91	0	0	1.8	-1.2	52	0	2	0	5.2	0.1
GCO	103	0	17	1.4	0.2	97	0	16	0	8.9	0.2
GRL	48	0	2	1.5	0.2	34	0	0	0	4.3	0.8
GTI	181	0	16	1.8	0.5	169	0	20	0	8.8	1.6
HXL	191	1	4	1.6	0.4	142	1	7	0	7.9	0.8
IBE	1315	0	6	1.4	0.3	1167	0	9	0	8.3	0.1
ICE	1039	1	5	1.7	-0.1	645	0	3	0	6.2	1.2
IWD	131	0	6	1.8	0.1	111	0	10	0	9.5	-0.7
KLM	1014	0	2	1.6	0.1	668	0	3	0	7.3	0.2
LAN	27	0	19	1.5	0.2	26	4	35	0	12.4	1.9
LDI	236	0	4	1.7	-0.1	182	1	4	0	8.1	0.5
LOT	201	0	2	1.7	-1.2	141	0	5	0	7.1	0.6
LTU	663	1	6	1.6	-0.4	507	0	5	0	6.5	0.5
MON	42	0	0	1.3	0.1	20	0	0	0	4.5	0.0
MPD	135	0	4	1.9	0.3	101	2	3	0	4.7	0.4
MPH	436	0	2	1.7	-0.9	288	0	3	0	7.6	0.1
MYT	182	1	3	1.4	-0.3	132	0	3	0	6.3	0.3
NCA	31	0	3	1.3	0.0	26	0	4	0	4.9	0.7
NWA	1866	0	2	1.6	0.3	1845	0	3	0	7.4	0.4
OAE	107	1	11	1.3	0.3	59	0	83	0	20.4	5.0
OOM	179	1	7	2.1	-1.6	107	0	6	0	6.5	0.6

	TEMPERATURE					WIND					
IDENT.	N.REP.	PG	PR	RMS	BIAS	N.REP.	PG	PR	PC	RMS	BIAS
PAC	246	1	10	2.1	-0.2	166	0	7	0	7.8	0.5
PLM	52	2	4	1.5	1.1	43	0	5	0	8.6	1.8
RAM	192	0	2	1.7	0.7	115	0	6	0	8.7	-0.4
RCH	185	2	100	4.1	-0.5	147	0	100	0	12.7	0.5
RJA	29	0	3	1.6	-0.7	21	0	5	0	8.0	1.7
RRR	142	0	9	1.8	-0.3	139	1	11	0	7.6	0.1
RZO	157	0	4	1.5	-0.8	133	0	6	0	8.8	0.0
SEU	118	1	4	1.7	0.0	106	0	5	0	8.2	-0.8
SSV	35	3	11	1.2	-0.1	22	0	14	0	4.3	1.4
SVA	25	4	12	1.1	0.2	20	0	15	0	7.9	0.7
TAP	181	0	3	1.5	-0.3	140	1	5	0	8.2	-0.8
TCX	60	0	5	1.5	0.4	35	0	3	0	5.1	0.4
TPA	25	0	4	1.0	0.2	20	0	0	0	4.9	0.6
TSC	165	2	6	1.9	-0.7	102	1	4	0	7.1	1.9
UAE	25	0	8	1.6	-0.2	26	0	4	0	5.1	0.5
UAL	249	0	57	2.0	-0.9	163	0	58	0	10.2	2.0
UPS	1068	0	45	1.5	-0.1	1046	0	46	0	8.2	0.3
USA	50	0	6	1.5	-0.2	42	0	5	0	5.4	0.2
VIR	139	1	5	1.9	-0.1	80	0	3	0	8.6	1.1
WOA	207	0	11	1.8	0.1	151	1	17	0	10.8	2.5
XLA	65	0	9	2.1	-0.4	62	0	6	0	7.2	0.9

	TEMPERATURE					WIND					
IDENT.	N.REP.	PG	PR	RMS	BIAS	N.REP.	PG	PR	PC	RMS	BIAS
EU	35779	0	18	1.2	0.1	35779	0	17	0	4.2	0.5
TN	30	0	10	2.2	1.9	28	0	14	0	8.3	1.0
N	596	1	5	2.1	0.4	364	0	2	0	6.6	0.6
US ACARS	19495	0	27	1.4	0.2	19495	0	25	0	5.2	0.5

TABLE 10

MONTHLY MONITORING OF RADIOSONDE OBSERVATIONS (COSNA)
MONITORING CENTRE: EXETER
MONTH: May 2004

Monitoring procedures

Period		:One calendar month.
Data monitored		:Reports from selected radiosonde TEMPs.
Area monitored		:0°N - 90°N, 100°W - 40°E
Standard of comparison		:Background field from UKMO global model.
Position		:Average latitude and longitude for period.
Observation times		:00, 12 UTC.
Level monitored		:100 hPa.
Element monitored		:GEOPOTENTIAL HEIGHT in metres
Parameters monitored	:NUM OBS	:Number of observations available at level shown during period.
	:NUM GROSS	:Number of gross errors at level shown during period.
	:SD	:SD of difference of observations from background values at level shown excluding those with gross errors.
	:BIAS	:Mean difference of observations from background values at level shown excluding those with gross errors.

GROSS ERROR LIMITS :Defined in Appendix I.1

WMO IDENT	OBS TIME	ELM	LEV	NUM OBS	NUM GROSS	SD	RMS	BIAS
DBBH	00	Z	100	17	0	7.0	37.5	36.9
DBBH	12	Z	100	20	0	11.2	38.1	36.4
DBLK	12	Z	100	11	0	11.0	23.2	20.5
EBUQ	12	Z	100	20	1	13.5	16.5	9.5
ELML7	00	Z	100	4	0	6.3	17.0	15.8
ELML7	12	Z	100	7	0	8.1	29.8	28.7
FQFL	00	Z	100	11	0	11.0	19.9	16.6
FQFL	12	Z	100	9	0	15.8	31.7	27.6
FQFM	00	Z	100	6	0	13.3	15.1	7.2
FQFM	12	Z	100	9	0	9.0	17.8	15.3
KHRH	00	Z	100	10	0	17.1	41.3	37.6
KHRH	12	Z	100	10	0	11.6	41.4	39.7
KRPD	00	Z	100	2	0	6.0	23.8	23.0
KRPD	12	Z	100	1	0	0.0	32.0	32.0
LDWR	00	Z	100	30	0	10.1	10.9	4.2
LDWR	12	Z	100	29	0	11.2	11.3	1.6
OXVH2	00	Z	100	5	1	10.1	27.9	26.0
OXVH2	12	Z	100	3	0	9.9	16.6	13.3
OXYH2	00	Z	100	6	1	13.8	26.4	22.5
OXYH2	12	Z	100	6	0	48.6	60.3	35.7
V2XM	00	Z	100	5	0	4.1	29.3	29.0
V2XM	12	Z	100	3	1	10.8	15.6	11.3
WPKD	00	Z	100	7	0	90.3	93.3	-23.4
WPKD	12	Z	100	6	0	21.6	30.6	21.7
ZCBP6	00	Z	100	10	0	17.0	43.9	40.5
ZCBP6	12	Z	100	12	0	12.3	36.4	34.3
03953	00	Z	100	30	0	10.8	23.9	21.4
03953	12	Z	100	30	0	14.1	22.9	18.1
04018	00	Z	100	30	0	8.9	19.9	17.8
04018	12	Z	100	30	0	11.2	17.6	13.6
04220	00	Z	100	28	0	11.2	15.6	10.9
04220	12	Z	100	29	1	11.7	15.0	9.3
04270	00	Z	100	29	0	11.6	13.7	7.4
04270	12	Z	100	28	0	14.6	16.3	7.3
04339	00	Z	100	30	0	12.0	17.5	12.8
04339	12	Z	100	30	0	11.4	18.4	14.4
04360	00	Z	100	30	0	17.1	18.9	8.0
04360	12	Z	100	30	0	19.3	20.0	5.5
08001	00	Z	100	23	0	18.3	19.5	6.5
08001	12	Z	100	28	0	21.3	21.7	-4.1
08508	12	Z	100	30	0	12.9	35.8	33.4
08522	12	Z	100	29	0	14.0	27.0	23.1
08594	12	Z	100	25	0	16.1	23.9	17.7
71600	00	Z	100	29	0	10.8	21.9	19.1
71600	12	Z	100	30	0	11.9	26.2	23.4
72201	00	Z	100	29	0	9.6	35.4	34.1
72201	12	Z	100	30	0	9.7	43.6	42.5
72402	00	Z	100	29	0	9.2	27.6	26.0
72402	12	Z	100	30	0	11.0	32.0	30.0
74494	00	Z	100	26	0	7.4	23.8	22.7
74494	12	Z	100	25	0	9.7	14.4	10.6
78016	00	Z	100	28	0	10.9	29.7	27.6
78016	12	Z	100	29	0	22.5	55.2	50.4

TABLE 11

MONTHLY MONITORING OF RADIOSONDE OBSERVATIONS (COSNA)
MONITORING CENTRE: EXETER
MONTH: May 2004

Monitoring procedures:

Period		:One calendar month.
Data monitored		:Reports from selected radiosonde TEMPs.
Area monitored		:0°N - 90°N, 100°W - 40°E
Standard of comparison		:Background field from UKMO global model.
Position		:Average latitude and longitude for period.
Observation times		:00, 12 UTC.
Level monitored		:500 hPa.
Element monitored		:GEOPOTENTIAL HEIGHT in metres
Parameters monitored	:NUM OBS	:Number of observations available at level shown during period.
	:NUM GROSS	:Number of gross errors at level shown during period.
	:SD	:SD of difference of observations from background values at level shown excluding those with gross errors.
	:BIAS	:Mean difference of observations from background values at level shown excluding those with gross errors.

GROSS ERROR LIMITS :Defined in Appendix I.1

WMO IDENT	OBS TIME	ELM	LEV	NUM OBS	NUM GROSS	SD	RMS	BIAS
DBBH	00	Z	500	17	0	4.6	12.2	11.4
DBBH	12	Z	500	20	0	5.9	13.6	12.3
DBLK	12	Z	500	12	0	7.6	8.0	2.4
EBUQ	12	Z	500	23	0	6.3	7.9	-4.7
ELML7	00	Z	500	5	0	5.7	6.9	-3.8
ELML7	12	Z	500	7	0	5.6	7.0	4.1
FQFL	00	Z	500	11	0	6.2	6.8	2.7
FQFL	12	Z	500	9	0	7.2	12.8	10.7
FQFM	00	Z	500	11	0	5.9	11.6	-10.0
FQFM	12	Z	500	10	0	11.0	12.6	-6.3
KHRH	00	Z	500	10	0	11.2	21.5	18.4
KHRH	12	Z	500	10	0	10.6	23.8	21.3
KRPD	00	Z	500	2	0	7.0	7.6	-3.0
KRPD	12	Z	500	1	0	0.0	6.0	6.0
LDWR	00	Z	500	30	0	8.2	8.3	0.6
LDWR	12	Z	500	29	0	7.4	7.6	-2.0
OXVH2	00	Z	500	5	1	9.0	11.7	7.4
OXVH2	12	Z	500	4	0	8.7	10.6	6.0
OXYH2	00	Z	500	6	1	13.2	15.2	7.5
OXYH2	12	Z	500	6	0	44.9	49.3	20.5
SHIP	00	Z	500	3	0	8.3	8.7	-2.3
SHIP	12	Z	500	1	0	0.0	5.0	-5.0
V2XM	00	Z	500	6	0	4.9	16.1	15.3
V2XM	12	Z	500	8	0	14.8	14.8	-0.1
WPKD	00	Z	500	7	0	40.8	45.6	-20.4
WPKD	12	Z	500	6	0	13.4	14.5	-5.5
ZCBP6	00	Z	500	13	0	11.6	28.3	25.8
ZCBP6	12	Z	500	12	0	11.1	30.3	28.2
03953	00	Z	500	30	0	6.0	6.5	2.7
03953	12	Z	500	30	0	7.0	7.8	3.5
04018	00	Z	500	30	0	8.8	12.8	9.3
04018	12	Z	500	30	0	7.9	10.9	7.5
04220	00	Z	500	28	0	7.5	12.4	9.9
04220	12	Z	500	29	1	5.8	10.8	9.1
04270	00	Z	500	29	0	10.1	11.7	5.9
04270	12	Z	500	30	0	11.1	11.4	2.8
04339	00	Z	500	30	0	6.5	11.8	9.8
04339	12	Z	500	30	0	7.7	11.0	7.9
04360	00	Z	500	30	0	8.9	10.2	5.0
04360	12	Z	500	30	0	10.2	11.2	4.7
08001	00	Z	500	26	0	10.4	11.5	-4.8
08001	12	Z	500	29	0	11.2	14.0	-8.4
08508	12	Z	500	30	0	6.4	6.7	2.1
08522	12	Z	500	30	0	9.0	9.6	3.5
08594	12	Z	500	27	0	4.9	5.2	-1.8
71600	00	Z	500	29	0	7.1	7.1	-0.2
71600	12	Z	500	30	0	9.2	10.5	5.1
72201	00	Z	500	29	0	6.1	6.2	-1.3
72201	12	Z	500	30	0	5.4	5.5	0.6
72402	00	Z	500	29	0	5.2	5.4	1.5
72402	12	Z	500	30	0	4.8	4.9	0.6
74494	00	Z	500	27	0	3.9	4.8	-2.9
74494	12	Z	500	28	0	6.7	7.4	-3.0
78016	00	Z	500	30	0	5.3	8.6	6.7
78016	12	Z	500	30	0	7.5	16.9	15.2

TABLE 12

MONTHLY MONITORING OF RADIOSONDE OBSERVATIONS (COSNA)
MONITORING CENTRE: EXETER
MONTH: May 2004

Monitoring procedures

Period :One calendar month.

Data monitored :Reports from selected radiosonde TEMPs.

Area monitored :0°N - 90°N, 100°W - 40°E

Standard of comparison :Background field from UKMO global model.

Position :Average latitude and longitude for period.

Observation times :00, 12 UTC.

Level monitored :100 hPa.

Element monitored :VECTOR WIND in m s^{-1}

Parameters monitored :NUM OBS :Number of observations available at level shown during period.

:NUM GROSS :Number of gross errors at level shown during period.

:UBIAS,VBIAS :Mean difference of observations of U and V components from background values at level shown excluding those with gross errors.

:RMS :Root Mean Square difference of observations from background values at level shown excluding those with gross errors.

GROSS ERROR LIMITS :Defined in Appendix I.2

WMO IDENT	OBS TIME	ELM	LEV	NUM OBS	NUM GROSS	% REJ	RMS	UBIAS	VBIAS
DBBH	00	V	100	15	0	0	4.2	0.7	1.0
DBBH	12	V	100	19	0	0	3.2	0.4	1.1
DBLK	12	V	100	11	0	0	4.3	0.4	1.4
EBUQ	12	V	100	15	0	100	8.2	0.8	0.4
ELML7	00	V	100	4	0	0	2.7	-1.9	-0.7
ELML7	12	V	100	7	0	0	3.2	1.3	1.0
FQFL	00	V	100	11	0	100	3.6	0.7	0.0
FQFL	12	V	100	9	0	100	3.9	1.1	-0.1
FQFM	00	V	100	6	0	0	3.1	0.0	-0.7
FQFM	12	V	100	9	0	0	4.0	0.1	-0.4
KHRH	00	V	100	8	0	100	11.7	0.1	2.1
KHRH	12	V	100	7	0	100	9.9	-2.0	1.1
KRPD	00	V	100	1	0	0	2.4	0.6	-2.3
KRPD	12	V	100	1	0	0	3.2	2.3	-2.2
LDWR	00	V	100	30	0	0	2.0	0.7	0.2
LDWR	12	V	100	29	0	0	1.7	0.1	0.2
OXVH2	00	V	100	6	0	0	2.8	-0.5	0.4
OXVH2	12	V	100	2	0	0	3.5	1.9	-1.3
OXYH2	00	V	100	5	0	0	3.5	-0.6	-1.1
OXYH2	12	V	100	2	0	0	5.4	-2.9	2.7
V2XM	00	V	100	3	0	0	2.0	-0.2	1.3
V2XM	12	V	100	1	0	0	1.1	-0.7	-0.8
WPKD	00	V	100	6	0	16	6.6	-4.0	0.8
WPKD	12	V	100	5	0	0	6.6	-2.1	1.2
ZCBP6	00	V	100	8	0	0	2.9	0.7	1.1
ZCBP6	12	V	100	4	0	0	4.3	0.4	1.1
03953	00	V	100	30	0	0	2.6	0.1	0.5
03953	12	V	100	29	0	0	2.7	0.5	0.7
04018	00	V	100	30	0	0	2.7	0.1	-0.4
04018	12	V	100	30	0	0	2.2	0.3	-0.3
04220	00	V	100	27	0	0	2.9	0.0	-0.2
04220	12	V	100	30	0	0	2.8	0.4	0.1
04270	00	V	100	28	0	0	3.5	-1.0	-0.4
04270	12	V	100	27	0	0	3.2	-0.8	-0.7
04339	00	V	100	25	0	0	3.9	1.1	-0.7
04339	12	V	100	27	0	0	3.6	0.0	0.9
04360	00	V	100	30	0	0	2.9	-0.2	0.3
04360	12	V	100	29	0	0	2.6	-0.7	-0.1
08001	00	V	100	23	0	0	4.2	0.7	1.6
08001	12	V	100	27	0	0	3.7	-0.3	-0.7
08508	12	V	100	13	0	0	4.1	0.6	0.6
08522	12	V	100	28	0	0	4.0	1.1	0.7
08594	12	V	100	25	0	100	5.3	-1.8	2.2
71600	00	V	100	28	0	0	3.5	0.2	0.3
71600	12	V	100	30	0	0	3.4	0.6	0.0
72201	00	V	100	29	0	0	2.6	0.5	0.3
72201	12	V	100	30	0	0	3.6	0.7	-0.8
72402	00	V	100	29	0	0	3.4	-0.6	-0.7
72402	12	V	100	30	0	0	3.2	0.5	0.1
74494	00	V	100	25	0	100	2.4	0.2	-0.3
74494	12	V	100	25	0	100	2.5	-0.5	-0.2
78016	00	V	100	28	0	0	4.1	1.0	-0.7
78016	12	V	100	27	0	0	3.6	0.1	0.3

TABLE 13

MONTHLY MONITORING OF RADIOSONDE OBSERVATIONS (COSNA)
MONITORING CENTRE: EXETER
MONTH: May 2004

Monitoring procedures		
Period		:One calendar month.
Data monitored		:Reports from selected radiosonde TEMPs.
Area monitored		:0°N - 90°N, 100°W - 40°E
Standard of comparison		:Background field from UKMO global model.
Position		:Average latitude and longitude for period.
Observation times		:00, 12 UTC.
Level monitored		:500 hPa.
Element monitored		:VECTOR WIND in m s^{-1}
Parameters monitored	:NUM OBS	:Number of observations available at level shown during period.
	:NUM GROSS	:Number of gross errors at level shown during period.
	:UBIAS,VBIAS:	Mean difference of observations of U and V components from background values at level shown excluding those with gross errors.
	:RMS	:Root Mean Square difference of observations from background values at level shown excluding those with gross errors.

GROSS ERROR LIMITS :Defined in Appendix I.2

WMO IDENT	OBS TIME	ELM	LEV	NUM OBS	NUM GROSS	% REJ	RMS	UBIAS	VBIAS
DBBH	00	V	500	17	0	0	3.3	-0.9	-0.6
DBBH	12	V	500	19	0	0	3.4	0.2	0.7
DBLK	12	V	500	12	0	0	4.3	0.3	-1.5
EBUQ	12	V	500	17	0	100	7.8	-2.1	-3.3
ELML7	00	V	500	5	0	0	3.4	0.4	-0.6
ELML7	12	V	500	7	0	0	2.2	0.9	0.4
FQFL	00	V	500	11	0	100	3.1	-1.4	0.0
FQFL	12	V	500	9	0	100	3.2	-0.2	0.5
FQFM	00	V	500	11	0	0	3.2	-0.7	1.2
FQFM	12	V	500	10	0	0	4.0	-1.1	-0.2
KHRH	00	V	500	7	0	100	9.1	2.3	1.1
KHRH	12	V	500	6	0	100	10.0	-0.7	-1.0
KRPD	00	V	500	1	0	0	1.1	0.9	-0.6
KRPD	12	V	500	1	0	0	2.1	-1.0	-1.8
LDWR	00	V	500	30	0	0	3.9	-0.2	-0.8
LDWR	12	V	500	29	0	0	3.8	-0.9	-0.5
OXVH2	00	V	500	6	0	0	3.6	-2.1	0.0
OXVH2	12	V	500	3	0	0	4.0	-1.5	-1.1
OXYH2	00	V	500	6	0	0	7.1	0.0	-2.7
OXYH2	12	V	500	3	0	0	2.9	0.0	0.3
SHIP	00	V	500	2	0	0	3.6	2.0	3.0
SHIP	12	V	500	1	0	0	0.9	-0.4	-0.8
V2XM	00	V	500	6	0	0	3.0	0.0	0.6
V2XM	12	V	500	7	0	0	4.3	-0.3	-1.4
WPKD	00	V	500	7	0	28	7.3	-4.2	0.7
WPKD	12	V	500	5	0	0	8.7	-5.0	0.5
ZCBP6	00	V	500	11	0	0	3.6	1.5	1.0
ZCBP6	12	V	500	4	0	0	2.9	-0.8	0.0
03953	00	V	500	30	0	0	4.2	0.3	0.6
03953	12	V	500	29	0	0	2.5	0.9	-0.3
04018	00	V	500	30	0	0	4.2	0.6	0.5
04018	12	V	500	30	0	0	4.5	1.5	0.0
04220	00	V	500	28	0	0	2.9	0.0	-0.7
04220	12	V	500	29	0	0	3.8	0.3	-0.2
04270	00	V	500	29	0	0	4.5	-0.8	-0.6
04270	12	V	500	30	0	0	4.2	-1.1	0.2
04339	00	V	500	30	0	0	5.0	-0.7	-0.9
04339	12	V	500	30	0	0	5.1	0.4	-0.5
04360	00	V	500	30	0	0	3.2	0.3	-0.1
04360	12	V	500	30	0	0	4.1	-0.1	-0.2
08001	00	V	500	26	0	0	4.8	-0.1	0.3
08001	12	V	500	27	0	0	3.5	0.3	0.0
08508	12	V	500	13	0	0	2.5	0.0	-0.2
08522	12	V	500	29	0	0	3.3	0.2	0.7
08594	12	V	500	28	0	100	4.3	-1.9	-0.5
71600	00	V	500	28	0	0	3.3	0.1	0.4
71600	12	V	500	30	0	0	4.1	-0.1	0.4
72201	00	V	500	29	0	0	2.4	0.2	-0.2
72201	12	V	500	30	0	0	2.5	0.1	-0.3
72402	00	V	500	29	0	0	2.7	-0.5	0.4
72402	12	V	500	30	0	0	3.9	0.5	0.5
74494	00	V	500	27	0	88	2.9	-0.6	-0.7
74494	12	V	500	28	0	82	4.2	-1.1	0.5
78016	00	V	500	30	0	0	5.1	-0.8	1.0
78016	12	V	500	30	0	0	3.7	0.3	-0.6

APPENDIX I

1. The gross error limits for observation minus background differences of geopotential height in Tables 5, 10 and 11 are:-

Level (hPa)	Geopotential height (metres)
1000	100
850	100
700	100
500	150
400	175
300	200
250	225
200	250
150	275
100	300
70	375
50	400
30	450

The weighted RMS values used in Table 5,10 and 11 are calculated using the following weights:-

Level (hPa)	Weight
1000	3.70
850	3.40
700	2.90
500	2.20
400	1.90
300	1.60
250	1.50
200	1.37
150	1.19
100	1.00
70	0.87
50	0.80
30	0.64

2. The gross error limits for observation minus background differences of windspeed in Tables 6,12 and 13 are:-

Level (hPa)	Windspeed m s^{-1}
1000	35
850	35
700	40
500	45
400	50
300	60
250	60
200	50
150	50
100	45